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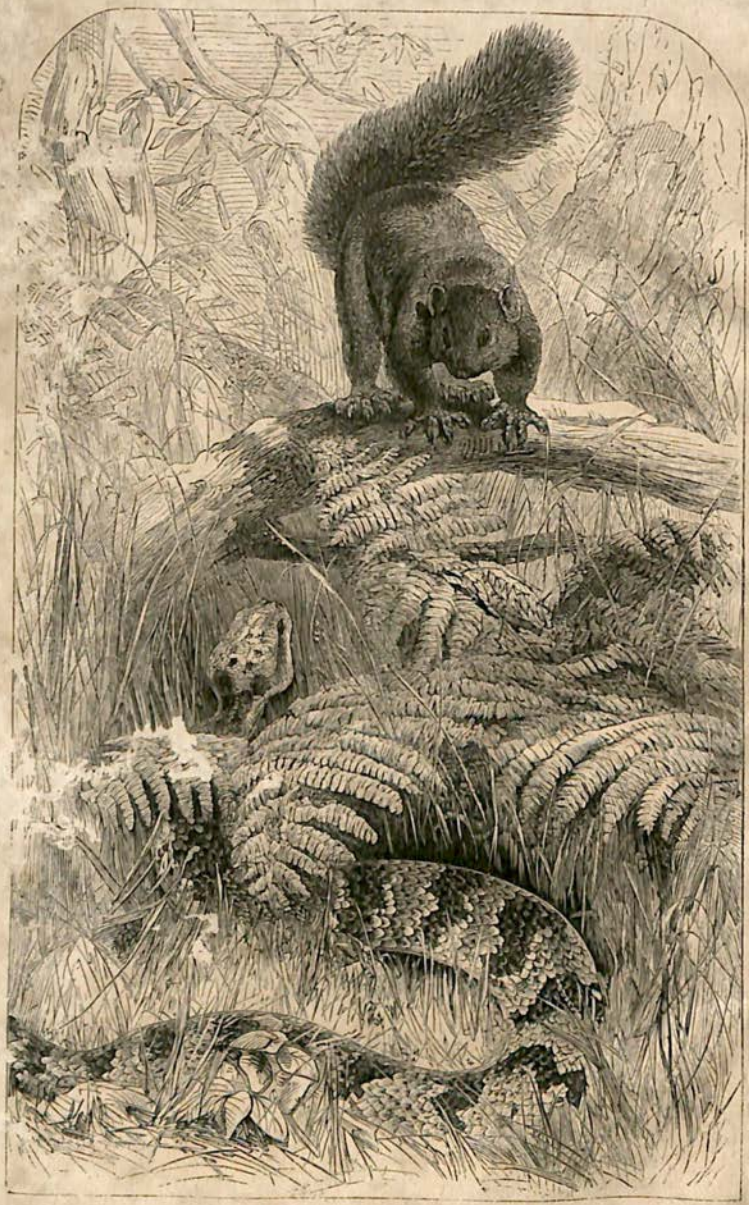

FASCINATION.

Front.

THE ROMANCE

OF

NATURAL HISTORY.

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BY

PHILIP HENRY GOSSE, F.R.S.

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THE ROMANCE OF NATURAL HISTORY.

I.

THE EXTINCT.

If it is a scene of painful interest, as surely it is to a well-constituted mind, to stand by and watch the death-struggles of one of the nobler brutes,—a dog or an elephant, for example,—to mark the failing strength, the convulsive throes, the appealing looks, the sobs and sighs, the rattling breath, the glazing eye, the stiffening limbs—how much more exciting is the interest with which we watch the passing away of a dying species. For species have their appointed periods as well as individuals: viewed in the infinite mind of God, the Creator, from the standpoint of eternity, each form, each race, had its proper duration assigned to it—a duration which, doubtless, varied in the different species as greatly as that assigned to the life of one individual animal differs from that assigned to the life of another. As the elephant or the eagle may survive for centuries, while the horse and the dog scarcely reach to twenty years, and multitudes of insects are born and die within a few weeks, so one

species may have assigned to its life, for aught I know, a hundred thousand years as its normal period, and another not more than a thousand. If creation was, with respect to the species, what I have elsewhere proved it was with respect to the individual,*—a violent irruption into the cycle of life—then we may well conceive this to have taken place at very varying relative periods in the life-history of the different species;—that is to say, that at a given date, (viz., that of creation) one species might be just completing, *ideally*, its allotted course, another just commencing, and a third attaining its meridian.

Certain it is, that not a few species of animals have died during the present constitution of things. Races, which we know on indubitable evidence to have existed during the dominion of man, have died out, have become extinct, so that not a single individual survives. The entire totality of individuals which constituted the species, have, in these cases, ceased to be. Some of these seem to have died at a very early era of human history; but others at a comparatively recent period, and some even within our own times. Even within the last twenty years several animals have been taken, of which it is highly probable that not a single representative remains on the earth; while there are others yet again, which we know to be reduced to a paucity so extreme, that their extinction can scarcely be delayed more than a few years at most. Thus we may consider ourselves as standing by the dying-beds of these creatures, with the consciousness that we shall

* See my *Omphalos,—passim.*

soon see them no more; that the sentence is gone forth against them; that their sands are running to the last grains, and that no effort of ours can materially prolong their existence. The facts from which these conclusions are drawn are highly curious, and I shall endeavour to lay them, with as much brevity as they will allow, before my readers.

On that prochronic hypothesis, by which alone, as I conceive, the facts revealed by geological investigation can be reconciled with the unerring statements of Scripture,—every word of which is truth, the truth of a "God that cannot lie,"—we may assume the actual creation of this earth to have taken place at that period which is geologically known as the later Tertiary Era, or thereabout. When, on the third day, "the waters under the heaven were gathered together into one place, and the dry land appeared," it is not necessary to suppose that the form assumed by the emerging land was immediately that which it now has; we may, on the other hand, I think, assume as likely, that successive or continuous changes of elevation followed, which have been protracted, perhaps constantly decreasing in extent and force, to the present hour.*

Perhaps between the six days' work of Creation and the Noachic Flood, Europe became much altered in outline, and in elevation. It may have been, at first, a great archipelago, agreeing with the epithet by which it is

* The gradual but constant elevation of the bed of the Baltic, and the subsidence of that of the Pacific Ocean, are examples on a large scale.

designated in early Scripture, "the Isles,"* and by which it was subsequently known for ages. The Pyrenees, the Alps, and the Apennines, already emerged, were slowly uniting, and the Carpathians, the Balkan, the Taurus, and the Caucasus, were uprearing, while the vast regions to the north were still an expanse of open sea. England was probably united with the newly-formed European continent, and embraced Ireland in one great mass of unbroken land, which stretched far away into the Atlantic. Volcanoes were active in the north of Ireland, and in the west of Scotland, pouring forth those floods of fiery lava which have cooled into the columnar forms seen at the Giant's Causeway and the Cave of Fingal. Slowly the north of Europe emerged, and the great south-west expanse of Britain sank beneath the sea, leaving, it may be, the large island of Atlantis in mid-ocean, to be submerged by a later catastrophe.

Probably changes very similar were coevally taking place in Asia and North America, while the vast flat alluvial regions of South America were, perhaps, even still more recently formed, and a great Pacific continent was in course of subsidence, of which Australasia and Polynesia are the existing remains.

Such changes of elevation, and of the continuity of land, must effect considerable alterations of climate; and, therefore, it is not surprising to know that, in earliest ages, animals and plants flourished in regions to which they would now be altogether unfitted, and that many

* Gen. x. 5.

races existed then which have since died out; for geological and climatal modifications are among the most easily conceivable causes of the decease of species.

In the great swamps of emerging Germany, and in the, as yet, only half-drained valleys of Switzerland, lurked then the heavy Dinothere. Huger than the hugest elephant, he carried an enormous body of twenty feet in length, vast and barrel-like, which even his columnar limbs of ten feet long scarcely sufficed to raise from the ground. His uncouth head, elephantine in shape, was furnished with a short proboscis; and two tusks, short and strong, projected from the lower jaw, not curving upward, as in the elephant, but downward, as in the walrus. In the teeming marshes lurked this ungainly beast, half immersed, digging out with his mighty pickaxe-tusks the succulent roots that permeated the soft soil, which his sensitive trunk picked up, and conveyed to his mouth.

On the southern slopes of the slowly-rising Himalayas, already clothed with forests of teak, and palm, and bamboo, revelled the Sivathere, another heavy creature, of the bulk of a rhinoceros, and therefore not more than half equalling the German colossus. He too was a strange subject. With a proportionally enormous head, in form somewhat between that of the elephant and of the rhinoceros, minute sunken piggish eyes, and a short proboscis like that of the tapir, he carried two pairs of dissimilar horns. On the forehead were placed one pair, seated upon bony cores, not unlike those of our short-horn oxen. Behind these there rose another pair, large and massive,

which were palmated and branching, like those of the fallow-deer, but on a gigantic scale. What sort of a body, and what kind of limbs, furnished the complement of this curiously-compound head, we do not exactly know; but surely it must have been a very remarkable form, as it browsed quietly and blamelessly, among the luxuriant shrubs of those sun-facing slopes.

In the same regions a land Tortoise of enormous bulk, far vaster than the vastest of now existing species, to which that ponderous one which will march merrily away with a ton weight on its back, is a mere pigmy, shook the earth with its waddle, and the forests with its hoarse bellowing. Broad roads, like our highways, were beaten by it through the jungle, along which it periodically travelled to the cool springs, leisurely sauntering, and tarrying to munch the fleshy gourds and cactuses that bordered its self-made track.

The plains of Siberia, stretching away towards the Arctic Ocean, sheltered countless hosts of huge pachydermatous quadrupeds. A species of Rhinoceros, not less bulky than those of the present age, roamed to the very verge of the Icy Sea; its hide, tough and leathery, was destitute of folds, but was clothed with tufts of rigid gray hair,—an ornament which is denied to our existing degenerates. Two horns, the front one of unusual massiveness and length, were seated, as in several of the African kinds, one behind the other, and were wielded by a head of great strength and development.

More remarkable still was that great hairy Elephant,

called the Mammoth, which appears to have swarmed in those cold plains by myriads. Of equal dimensions to the Indian species of the present age, this denizen of the north had far more enormous curving tusks, and instead of the naked hide of those we are familiar with, his body was encased in black hair, with a thick under stratum of red curled wool, and bore a long mane on the ridge of the neck.

There was, at the same time, a quadruped, nearly allied to the elephants, but differing from them in some technical characters. With a body equally bulky, but considerably longer, it had shorter limbs, a broader head, small tusks in the lower, as well as large curving ones in the upper jaw, and probably a trunk intermediate between the elephant's and the tapir's. Truly cosmopolite as this great Mastodon was, for we dig up his bones from all parts of the world, he had his head-quarters in North America, where, from his dimensions and his numbers, he must have formed a very characteristic feature of the primeval swamps and forests. There, with his tusks, he grubbed up the young trees, whose juicy roots he ground down with his great mammillary molar teeth, or chewed up to a pulp the sapwood of the recent branches and spicy twigs.* And ever and anon he would resort to the broad saline marshes,—the "Licks," as they are now called,—to lick up the crystallised salt on their margins, so grateful to all herbivorous quadrupeds. Here, in his eagerness to gratify his palate with the pungent condiment, he would press farther and farther into the treacherous quagmire,

till he began to sink, and then, in his terror, he would plunge and flounder, getting more and more deeply bemired, till at length he could struggle no more, and the bog would close over him, and he would be no more seen till some spectacled geologist of this nineteenth century, note-book in hand, would go and dig up his remains, marvelling at the freshness with which they had been preserved in the antiseptic peat.

But let us look at South America, where, as the great back-bone chain of the Andes is being elevated out of the sea, the torrents and cataracts are pouring down from its sides immense quantities of crumbled rock and pasty mud, which, deposited upon the vast tabular field, brought by the upheaving just to the level of the sea, forms that grand alluvial plain unequalled on the face of the globe for extent, which is clothed with the mighty forests of Guiana and Brazil, or with the tall grass and thistles of the Pampas. The torrents still fall; and, meandering through this glorious plain, unite and form the most majestic of rivers, ever depositing the rich alluvium, and thus sensibly augmenting, to this day, the breadth of their noble continent, and their own length.

Strange creatures riot here in these primal ages. The young land, hot and moist,—moist with the unevaporated water of the depositing rivers, and hot with the influence of the submarine volcano which is lifting it, as well as with the beams of the tropical sun,—brings forth from its steaming bosom, the most gigantic trees in the most profuse luxuriance. And animal life teems too, in this riant

vegetation. Millions of insects,—ants, and termites, and beetles,—are busy at work upon the trunks of the great trees, eating them down, and swarming in their immense populous nests, beyond all imaginings. Surely they will soon eat up the entire forest, dense and rapid as it grows, and there will be nothing left but cities of insects. No fear! See those great waddling beasts * with stout short legs, and enormous hoof-like claws so bent inward that the creatures are obliged to walk on the edge of their paws,—they are equally busy with the insects, tearing apart with their powerful claws the earthy nests as fast as they are built, and devouring the makers themselves by wholesale. Here is a wonderful creature, a vast armadillo, with a body as big as a rhinoceros, covered with a convex oval shield, formed of hexagonal plates accurately fitted to each other. See how he approaches a fallen tree, which his unerring instinct tells him is perforated through and through, and filled with the swarming millions of ants; with his powerful jaws he munches up the entire mass; the thin and papery partitions of the dusty wood are ground to powder, and the ants are licked in and chewed into a black pulp between those curious cylinders of teeth.

But lo! here are mightier creatures yet! See the vast Mylodon, the Scelidothere, and the still more colossal Megathere. Ponderous giants these! The very forests seem to tremble under their stately stride. Their immense bulk preponderates behind, terminating in a tail

* *Chlamydotherium, Euryodon, Glossotherium, &c.*

of wonderful thickness and solidity: the head is mean and awakens no terror; the eye lacks lustre and threatens no violence, though the whole form betokens vast power, and the stout limbs are terminated by the same stout, inbent, sharp hoof-claws. One of them approaches that wide-spreading locust-tree; he gazes up at the huge mud-brown structures that resemble hogsheads affixed to the forks of the branches, and he knows that the luscious termites are filling them to overflowing. His lips water at the tempting sight; have them he must. But how? that heavy sternpost of his was never made for climbing; yet see! he rears himself up against the tree; is he about to essay the scaling? Not he: he knows his powers better. He gives it one embrace; one strong hug; as if to test its thickness and hold upon the earth. Now he is digging away below, scooping out the soft soil from between the roots,—and it is marvellous to note how rapidly he lays them bare with those great shovel-like claws of his. Now he rears himself again; straddles wide on his hind feet, fixing the mighty claws deep in the ground; plants himself firmly on his huge tail, as on the third foot of a tripod, and once more grasps the tree. The enormous hind quarters, the limbs and the loins, the broad pelvis, the thick spinal cord supplying abundant nervous energy to the swelling muscles, inserted in the ridged and keeled bones, all come into play, as a *point d'appui* for the Herculean effort. "And now conceive the massive frame of the Megathere convulsed with the mighty wrestling, every vibrating fibre reacting upon its bony

attachment with the force of a hundred giants: extraordinary must be the strength and proportions of the tree, if, when rocked to and fro, to right and left, in such an embrace, it can long withstand the efforts of its assailant."* It yields; the roots fly up; the earth is scattered wide upon the surrounding foliage; the tree comes down with a thundering crash, cracking and snapping the great boughs like glass; the frightened insects swarm out at every orifice; but the huge beast is in upon them; with his sharp hoofs he tears apart the crusty walls of the earth-nests, and licks out their living contents, fat pupæ, eggs and all, rolling down the sweet morsels, half sucking, half chewing, with a delighted gusto that repays him for all his mighty toil.

While the heavy giant is absorbed in his juicy breakfast, see, there lounges along his neighbour, the Macrauchen. Equally massive, equally heavy, equally vast, equally peaceful, the stranger resembles a huge rhinoceros elevated on much loftier limbs; but his most remarkable feature is an enormously long neck, like that of the camel, but carried to the altitude of that of the giraffe. Thus he thrusts his great muzzle into the very centre of the leafy trees, and gathering with his prehensile and flexible lip the succulent twigs and foliage, he too finds abundance of food for his immense body, in the teeming vegetation, without intruding upon the supply of his fellows.

And what enormous mass is suddenly thrust up out of the quiet water of yonder igaripé? A hoarse, hollow

* Owen *On the Mylodon.*

grunt, as it comes up, tells us that it is alive, and now we discern that it is the head of an animal—the Toxodon. Half hidden as it is under the shadow of the fan-palms, and the broad, arrowy leaves of the great arums that grow out of the lake, we see the little piggish eyes, set far up in the great head, and wide apart, peeping with a curious union of stupidity and shrewdness; the immense muzzle and lips; the broad cheeks armed with stiff projecting bristles; and, as the creature opens its cavernous mouth to seize a floating gourd, an extraordinary array of incurving teeth, strangely bowed so as to make a series of arches of immense power. Now, with his strong front teeth, he tears up the great fleshy arum-roots from the clay of the bank, and grinds them to pulp; and now, with another grunt, the vast bristly head sinks beneath the water, and we see it no more. Hundreds of other creatures are straying around,—sloths, bats, and monkeys, and birds of gay plumage, on the trees; ant-eaters and cavies, lizards and snakes, on the ground; butterflies and humming-birds hovering in the air; tapirs and turtles and crocodiles in the waters;—but these are matters of course: —we are only thinking of such as have passed away and left no descendants to perpetuate their forms to our own times.

Away to the great Austral land—in our day minished to the insular Australia and New Zealand and a few satellite isles—but then, in the morning of creation, possibly stretching far to the north and on either hand, so as to include the scattered groups of Polynesia in one great

continent, and even to reach so far as Madagascar on the west. This was the region of gigantic fowls, and of marsupial quadrupeds. Kangaroos of eight or nine feet in stature leaped over the primeval bush, and wombats and dasyures of elephantine bulk burrowed in the hill sides, and great lion-like beasts prowled about the plains. But surely the most characteristic feature of the scene was impressed by the birds! Vast struthious birds, which would have looked down with supreme contempt on the loftiest African ostrich, whose limb-bones greatly exceeded in bulk those of our dray horses, whose three-toed feet made a print in the clay some eighteen inches long, and whose proud heads commanded the horizon from an elevation of twelve feet above the ground,—terrible birds, whose main development of might was in the legs and feet, being utterly destitute of the least trace of wings—these strode swiftly about the rank ferny brakes, possessing a conscious power of defence in the back stroke of their muscular feet, and fearless of man or beast, mainly nocturnal in their activity, concealing themselves by day in the recesses of the dense forests, where the majestic trees were interwoven with cable-like climbers, or couching in the midst of tall reeds and aroideous plants that margined the great swampy lakes of these regions.

But what of our own land? What of these distant isles of the Gentiles in that early day, when the enterprising sons of Cain, migrating from the already straitened land of Nod, were pushing their advancing columns, with arts

and arms, in all directions over the young earth? Did any of them reach to the as yet insular Europe, settling themselves along the margins of its deep gulfs and draining basins? Perhaps they did, and even explored the utmost limits of the great Atlantic island, on the remains of which we live. What did they find here? A land of mountain and valley, of plain and down, of lake and river, of bog and fell, of forest and field, in some features much as now: where the oak, and elm, and ash covered great tracts, and the birch and fir clothed the hills; but where the yew and the laurel grew side by side with the custard-apple and the fan-palm, and the ground was overrun with trailers of the gourd and melon kind, but where grasses were few and scarce, the exquisite order *Rosaceæ*, with its beautiful flowers and grateful fruit, was rarely seen, and the aromatic *Labiatæ*—the thyme, and mint, and sage—were as yet unknown.

And the beasts that already tenanted this fair land were for bulk and power worthy of the domain. The Dinothere and the Mastodon wallowed and browsed where great London now crowds its princely palaces. Through the greenwood shades of the forests of oak wandered hippopotamuses and rhinoceroses of several kinds, the long-tusked mammoth, and two or three species of horses. Two gigantic oxen—a bison and a urus—roamed over the fir-clad hills of Scotland, and a curious flat-headed ox, of small size and minute horns, made Ireland its peculiar home. That island, too, was the metropolis of a colossal fallow-deer, whose remains, ticketed as those of the Irish

Elk, astonish us in our museums. It stood seven feet in height at the withers, and waved its branching antlers, eleven feet wide, twelve feet and upwards above the ground;* yet its magnificent stature could not preserve it from a not infrequent fate, that of becoming intombed in the deep bogs of its native isle. Britain had, moreover, a stag of scarcely less gigantic proportions, with the reindeer of the north, and the smaller kinds with which we are now familiar.

All these herbivores, and numberless smaller genera, some now extinct, some surviving, were kept in check by powerful predatory tyrants, for whose representatives we must now look to the jungles of India or the burning karroos of Southern Africa. The Lion and the Tiger stalked over these isles, and a terrible tiger-like creature, the Machairode, of even superior size and power to the scourge of the Bengal jungle, with curved and saw-edged canine-teeth, hung upon the flanks of the cervine and bovine herds, and sprang upon the fattest of them. Then, too, there was a vast Bear, huger and mightier than the

* Perhaps the most complete and the most magnificent skeleton of this animal ever discovered, was exhumed in 1849 at Killowen, in Co. Wexford. It was buried *only four feet below the surface*, between the vegetable mould and plastic clay. The roots of the black willow and German rush had entwined themselves round the bones, and some seeds, ascertained to be those of the wild cabbage, were found in the same bed. The dimensions of the skeleton were as follows:—Height, 12¼ feet to the tips of the horns, 7 feet to the top of the pelvis; expanse of horns 11 feet in a chord, or 13 feet 6 inches along the curve; palm of the antlers 2 feet 7 inches long by 1 foot 5 inches broad, some of the snags 2 feet 6 inches long; the face 1 foot 10½ inches in length.

fearful grizzly bear of America, which haunted caves, and prowling around forced down with its horrid paws the shaggy bull, and broke his stout neck by main force, and dragged the body home to devour at leisure. And many of these caves, the holes and chasms of the limestone districts, were inhabited by a gigantic species of Hyena, which seems to have existed in great numbers, so that the caverns are strewn all over, from end to end, with thousands of teeth and disjointed bones, both of the hyenas themselves and of the other carnivores; shewing that there they lived and died in successive generations; and, mainly, of other creatures, of very varied species, great and small, most of them cracked, and crushed, and gnawed, shewing the plain marks of the powerful conical teeth of those obscene nocturnal animals.

Thus I have endeavoured to draw a picture, vague and imperfect, I know, of some of the more remarkable and prominent features of the primeval earth, limiting the sketch to those forms which we know only by their fossil remains. In endeavouring to paint their contour and general appearance, and still more their habits and instincts, conjecture must be largely at work—a conjecture, however, which takes for its basis the anatomical exigencies of the osseous structure, and the analogy of existing creatures the most nearly related to the fossil.

These forms, many of them so huge and uncouth, are well known as having tenanted various regions of the earth during what is known as the Tertiary Era, in its later periods. They certainly do not exist in those regions

now. When did their life—their species-life—terminate? I have been assuming that they were upon the earth, as living sentient beings, in the earliest age of what we call the historic period—that is, according to the chronology of the Word of God, which must be true, within the last six thousand years. This assumption is so heterodox, that unsupported by evidence, it would be generally rejected; let us then inquire what evidence there is that man was an inhabitant of the globe contemporaneously with these huge giants of the bestial creation.

I do not pretend to offer positive evidence concerning the synchronism of *all* the animals I have been describing with man; but, as there is no doubt that they were all contemporaneous, *inter se*, if we can attain to good grounds for concluding his co-existence with *some* of them, it may be no unfair presumption that the case was so with the others.

And first, with respect to the *Colossochelys Atlas*, that vast fossil land tortoise of the Sewalik hills, in the north of India, whose carapace may have covered an area of twelve or fifteen feet in diameter, and whose entire length, as in walking, when head and tail were protruded, could not have been much less than thirty feet. The discoverers of this interesting relic, Dr Falconer and Major Cauntley, have discussed the question of its probable cessation of existence with some care; and they have come to the conclusion "that there are fair grounds for entertaining the belief, as probable, that the *Colossochelys Atlas* may have lived down to an early period of the human

epoch, and become extinct since." This they infer on two grounds: first, from the fact that, in the same strata, which are not limited to the Sewalik hills, but extend, with the remains of this immense tortoise, all over the great Indian area, from Ava to the Gulf of Cambay, other tortoises, crocodiles, &c., which were contemporary with the *Colossochelys*, have survived to the present time; and, secondly, from mythologic and cosmogonic traditions of many eastern nations, having reference to a tortoise of such gigantic size as to be associated in the current fables with an elephant.*

Elian, the Greek naturalist, quoting Megasthenes, a still older authority, who resided several years in India, and who collected a good deal of interesting information concerning the country, reports that in the sea around Ceylon there were found tortoises of such enormous dimensions that huts were made of their shells, each shell being fifteen cubits (or twenty-two feet) long; so that several people were able to find comfortable shelter under it from the rain and sun.† And both Strabo and Pliny‡ assert that the Chelonophagi, who inhabited the shores of the Red Sea and the Persian Gulf, converted the enormous shells of the turtles which they caught into roofs for their houses and boats for their little voyages. It has been suggested that the *Colossochelys* may have given origin to these statements; but I rather think the great sea-turtles of the genus *Chelone* are referred to, the convex

* *Annals of Nat. Hist.* xv.

† *Hist. Animals*, xvi. 17.

‡ *Nat. Hist.* ix. 10.

shells of which are known in our own day to reach to a length of eight feet or upwards.

The circumstances attending the discovery of the rhinoceros and elephant of Siberia are very curious and interesting; since of them we have not the fossilised skeletons, but the carcases preserved in a fresh state, as if just dead, with (in one case) the flesh upon the bones in an eatable state, and actually forming the food of dogs and wolves, the skin entire, and covered with fur, and even the eyes so perfectly preserved that the pupils could be distinctly seen.

In 1771, in the frozen gravelly soil of Wilhuji, in the northern part of Siberia, an animal was found partially exposed. It was twelve feet in length; its body was enveloped in a skin which had the thickness and firmness of sole-leather, but was destitute of folds. Short hair, strongly planted in the pores of the skin, grew on the face in tufts; it was rigid in texture, and of a grey hue, with here and there a black bristle, larger and stiffer than the rest. Short ash-grey hair was observed to clothe the legs, in moderate profusion. The eyelids and eyelashes were still visible; the remains of the brain were still in the cavity of the skull, and the flesh of the body, in a putrefying condition, was still beneath the skin. On the nose there were indications of a horn having been seated, around which the integument had formed a sort of fold.

Thus the creature was known to be a Rhinoceros, and the head and feet were lifted, and conveyed to St Petersburg, where they are still preserved in the Imperial

Museum. Men of science soon remarked that in very many points this specimen differed from any species now known; and, indeed, a hairy rhinoceros was, in itself, an anomaly. Subsequent investigations have revealed that the same species, known as *Rhinoceros tichorhinus*, inhabited Siberia in great numbers, and is now extinct.

Nearly thirty years afterwards a still more interesting revelation occurred. The shores of the Icy Ocean had yielded a vast number of tusks, not distinguishable from those of the known elephants, and capable of being worked up by ivory-manufacturers, so that they occupied a well-recognised place in the commercial markets, and they constitute to this day the principal supply of the Russian ivory-turners. A fisherman living at the mouth of the Lena, being one day engaged in collecting tusks, saw among some ice-blocks an uncouth object. The next year he observed it still further exposed, and in the following season, 1801, he saw that it was an enormous animal, having great tusks, one of which, with the entire side of the carcase, projected from the frozen mass. He knew it to be a *Mammoth*, for so the fossil elephants were called, and observed it with interest. The next season was so cold that no change took place; but in 1803, the melting of the ice proceeded so far that the gigantic animal fell down from the cliff entire, and was deposited on the sand beneath. The following season the fisherman, Schumachoff, cut out the tusks, which he sold for fifty rubles, and two years after this the scene was visited by Mr Adams, in the service of the Imperial Court, who

has given an interesting account of his observations, made, it must be remembered, in the seventh year after the first discovery :—

"I found the Mammoth," observes this gentleman, "still in the same place, but altogether mutilated . . . . the Jakutski of the neighbourhood having cut off the flesh, with which they fed their dogs during the scarcity. Wild beasts, such as white bears, wolves, wolverines, and foxes, also fed upon it, and the traces of their footsteps were seen around. The skeleton, almost entirely devoid of its flesh, remained whole, with the exception of one fore-leg. The head was covered with a dry skin ; one of the ears, well preserved, was furnished with a tuft of hairs. All these parts have necessarily been injured in transporting them a distance of 7330 miles (to St Petersburg) ; but the eyes have been preserved, and the pupil of one can still be distinguished.

"The Mammoth was a male, with a long mane on the neck. The tail and proboscis were not preserved. The skin, of which I possess three-fourths, is of a dark-grey colour, covered with reddish wool and black hairs ; but the dampness of the spot, where it had lain so long, had in some degree destroyed the hair. The entire carcase, of which I collected the bones on the spot, was nine feet four inches high, and sixteen feet four inches long, without including the tusks, which measured nine feet six inches along the curve. The distance from the base or root of the tusk to the point is three feet seven inches. The two tusks together weighed three hundred and sixty

pounds, English weight, and the head alone four hundred and fourteen pounds.

"I next detached the skin of the side on which the animal had lain, which was well preserved. This skin was of such extraordinary weight that ten persons found difficulty in transporting it to the shore. After this I dug the ground in different places, to ascertain whether any of its bones were buried, but principally to collect all the hairs which the white bears had trod into the ground while devouring the flesh. Although this was difficult from the want of instruments, I succeeded in collecting more than a pood (thirty-six pounds) of hair. In a few days the work was completed, and I found myself in possession of a treasure which amply recompensed me for the fatigues and dangers of the journey, and the considerable expenses of the enterprise. . . . . The escarpment of ice was thirty-five to forty toises high; and, according to the report of the Tungusians, the animal was, when they first saw it, seven toises below the surface of the ice, &c. On arriving with the Mammoth at Borchaya, our first care was to separate the remaining flesh and ligaments from the bones, which were then packed up. When I arrived at the Jakutsk, I had the good fortune to repurchase the tusks, and from thence expedited the whole to St Petersburg. The skeleton is now in the Museum of the Academy, and the skin still remains attached to the head and feet. A part of the skin, and some of the hair of this animal were sent by Mr Adams to Sir Joseph Banks, who presented them to the Museum of the Royal College of Surgeons. The hair

is entirely separated from the skin, excepting in one very small part, where it still remains attached. It consists of two sorts, common hair and bristles, and of each there are several varieties, differing in length and thickness. That remaining fixed on the skin is of the colour of the camel, an inch and a-half long, very thick-set, and curled in locks. It is interspersed with a few bristles about three inches long, of a dark-reddish colour. Among the separate parcels of hair are some rather redder than the short hair just mentioned, about four inches; and some bristles nearly black, much thicker than horse hair, and from twelve to eighteen inches long. The skin, when first brought to the Museum, was offensive; it is now quite dry and hard, and where most compact, is half-an-inch thick. Its colour is the dull black of the living elephants."*

To me this narrative possesses an intense interest, and I have gazed with great curiosity on the bit of dried and blackened leather that is preserved in the Museum in Lincoln's-Inn-Fields, knowing it to have presented the primal freshness of life within the present century. I cannot help thinking that both the rhinoceros and this elephant roamed over the plains of Siberia, not only since the creation of man, but even since the Deluge. The freshness of their state shews that the freezing up of their carcases must have been sudden, and immediate upon death. What supposition so natural as that, perhaps in a blinding snowstorm, they slipped into a crevice in the ice-cliff, were snowed up instantly, and thus preserved by the

* *On the Mammoth or Fossil Elephant, &c.* London, 1819.

antiseptic power of frost to this age? The glaciers of the north may hold multitudes more of these and kindred creatures, some of which may yet be disinterred, or thawed out, and may lift yet more the curtain which so tantalisingly covers the conditions of their life-history. These two huge Pachyderms are certainly extinct now; yet their remains, scattered over so vast an area, are everywhere associated with those of other animals which were indubitably contemporary with them, and whose species-life is continued to our own times. Some of these, as the great bear and the musk-ox of the sub-polar regions, we know to be in the habit of migrating northward in spring, and southward in autumn. That no lack of suitable food would be found, even in such high latitudes, for browsing quadrupeds, appears from the fact that, even beyond the parallel of 75° north, large birch-trees are found embedded in the cliffs, in abundance sufficient to be largely used as common fuel, and still retaining their woody fibre, their bark, branches, and roots. The climate then was not *greatly* different from what it is now, when the birch, as a tree, reaches to about 70°.

It is interesting to observe that both this elephant and this rhinoceros were inhabitants of England also; and that at the same period as the cavern bear, the hyena, the lion, and the machairode, the baboon, the bison, and the urus, the Irish elk, and the extinct horse; at the same time too, as the rein-deer, the stag, the black bear, the wolf and fox, the beaver, the wild cat, the hare, and rabbit, the otter and badger, the wild hog, the rat and mouse, all our

present shrews, the mole, the stoat and polecat, the noctule and the horse-shoe bats. And curious it is to note, as we go over this list, how some of the creatures enumerated are long extinct everywhere, some have been long extinct in England, but are still found elsewhere, some have more recently become extinct here, but at different eras, some are nearly extinguished, and some are yet abundant in different degrees.

I do not attach much importance to the traditions of the Siberians, that the tusks and skeletons which they find belonged to a large subterraneous animal, which could not bear the light; nor to those of the Chinese, respecting a similar burrowing quadruped of prodigious bulk, which they call, by a sort of irony, *tyn-schu*, or the mouse that hides himself. The fables may have easily been formed from the observation of the fossil bones, and do not necessarily imply any memory of the living original.

The two examples of the exhumation of *Pachyder-mata* in a fresh state, which I have given in detail, are by no means the only cases that have occurred. It is the universally-received belief throughout Siberia, that Mammoths have been found with the flesh quite fresh and filled with blood; probably meaning that the animal juices flowed when thawed. Isbrand Ides mentions a head on which the flesh, in a decaying state, was present; and a frozen leg, as large as the body of a man; and Jean Bernhard Müller speaks of a tusk, the cavity of which was filled with a substance which resembled coagulated blood.

Again, in the voyage of Sarytschew, particulars are given of the discovery of a Mammoth on the banks of the Alaseia, a river which flows into the Arctic Ocean, beyond the Indigirska. It had been dislodged by a flood, and somewhat injured; but the carcase was still almost entire, and was covered with the skin, to which in some places long hair remained attached.

These statements might reasonably have been esteemed either fables or gross exaggerations, but for the subsequent discovery of the rhinoceros and elephant whose remains have been brought to Europe. Read in the light of these accounts, the earlier stories take the dignity of authentic history; and it is interesting to note how well these details agree with those observed by the accurate Adams;—the long hair, for example, with which the Alaseia carcase was clothed being the very counterpart of that upon the Lena elephant; though *à priori* we should have looked for a very different condition in the integument of these huge Pachyderms.

If we look now at the great Mastodon, that elephantine beast, which with a stature equal to that of the tallest African elephant combined a much greater length of body and bulk of limb, we shall see some reason for concluding that the period of its decease is not indefinitely removed from our own era. Its remains occur in greatest abundance in North America; and it is interesting to observe that among several of the aboriginal tribes of Red men there were extant traditions of the Mastodon as a living creature. Dim, vague, and distorted these

traditions are; but so far from our rejecting them *in toto* on that account, we ought rather to consider these characters as evidence of their antiquity. When semi-savage nations present us with orally-preserved accounts of very remote objects or actions, we look, as a matter of course, for a considerable element of the wild, and extravagant, and absurd in them. If we found nothing but what was reasonable, and consistent, and intelligible, we should say in a moment, this account cannot have been transmitted very far. The question, in the case before us, is not, we must remember, the precise habits and instincts of the Mastodon, but whether the Indians knew anything at all of the Mastodon having ever been a living animal. Now, as I have observed, they had. M. Fabri, a French officer who had served in Canada, informed Buffon that the Red men spoke of the great bones which lay scattered in various parts of that region as having belonged to an animal which, after their oriental style, they named *Le Père aux Bœufs.* The Shawnee Indians believed that with these enormous animals there existed men of proportionate development, and that the Great Being destroyed both with thunderbolts. Those of Virginia stated that, as a troop of these terrible quadrupeds were destroying the deer, the bisons, and the other animals created for the use of the Indians, the Great Man slew them all with His thunder, except the big bull, who, nothing daunted, presented his enormous forehead to the bolts, and shook them off as they fell, till, being at last wounded in the side, he fled towards the great lakes, where he is to this day.

Evidence of the comparatively-recent entombment of these remains exists, however, of another character. They do not in general appear to have been rolled, but to have lived where they are now found; in some instances, as along the Great Osage River, being imbedded in a vertical position, as if the animals had been suddenly bogged in the swampy soil. Nor is there any great accumulation of earth upon them generally. All along the edges of that great saline morass called, from the abundance of these animal relics, Big Bone Lick, and on the borders, the skeletons are found sunk in the soft earth, many of them not more than a yard or two below the surface, and some even scarcely covered. With them are found in large numbers the bones of the existing bison, the wapiti-stag, and other herbivores, which still throng to the same place, for the same reasons, and meet the same fate.

Comparative anatomy determines, from the structure of the bones of the head in the Mastodon, that it must have carried a proboscis like that of the elephant. This, though wholly fleshy, has left traces of its existence. Barton reports that, in 1762, out of five skeletons which were seen by the natives, one skull still possessed what they described as a "long nose" with the mouth under it. And Kalm, in speaking of a skeleton, discovered by the Indians in what is now the State of Illinois, says that the form of the trunk was still apparent, though half decomposed. The preservation of these perishable tissues in this case must doubtless be attributed to the salt with which the bog-earth is saturated. Still more recently a

skeleton was found in Virginia, which contained a very interesting proof of the food of the animal: a mass of twigs, grass, and leaves, in a half-bruised state, enclosed in a sort of sac, lay within the cavity of the body, doubtless the contents of the stomach. Some of the twigs could be identified as those of existing species of trees and shrubs, among them a species of *rose*, still common in the region.

All this is very strong evidence that the deposition of these remains cannot have taken place in a *very* remote era,—that, in fact, it must have been since the general deluge recorded in the Word of God.

Hugh Miller has an interesting observation concerning the actual date of geologic phenomena in North America, compared with that of their counterparts in the Old World. He says, "The much greater remoteness of the mastodontic period in Europe than in America is a circumstance worthy of notice, as it is one of many facts that seem to indicate a general transposition of at least the later geologic ages on the opposite sides of the Atlantic. Groups of corresponding character on the eastern and western shores of this great ocean were not contemporaneous in time. It has been repeatedly remarked that the existing plants and trees of the United States, with not a few of its fishes and reptiles, bear in their forms and constructions the marks of a much greater antiquity than those of Europe. The geologist who set himself to discover similar types on the eastern side of the Atlantic, would have to seek for them among the deposits of the later tertiaries.

North America seems to be still passing through its later tertiary ages; and it appears to be a consequence of this curious transposition, that while in Europe the mastodontic period is removed by two great geologic eras, from the present time, it is removed from it in America by only one." *

Professor Agassiz has expressed opinions of the same character, adducing the present existence in America of several forms of animals, which are known in this hemisphere only in a fossil state. †

I cannot refrain from adding the following combination of fact and speculation, from the pen of an accomplished traveller in Mexico. It opens up a new train of ideas:—

"Some time before our visit, a number of workmen were employed on the neighbouring estate of Chapingo, to excavate a canal over that part of the plain from which the waters have gradually retired during the last three centuries. At four feet below the surface, they reached an ancient causeway, of the existence of which there was of course not the most remote suspicion. The cedar piles, by which the sides were supported, were still sound at heart. Three feet below the edge of this ancient work, in what may have been the very ditch, they struck upon the entire skeleton of a Mastodon, embedded in the blue clay. Many of the most valuable bones were lost by the careless manner in which they were extricated; others were ground to powder on their conveyance to the capital, but sufficient remained to prove that the animal had been of great size.

* *Testimony of the Rocks*, p. 97. † See vol. i. p. 361, *supra*.

My informant measured the diameter [*qu.* circumference?] of the tusk, and found it to be eighteen inches.

"Though I should be very glad to take shelter under the convenient *Quien sabe?* the use of which I have suggested to you, I could not avoid, at the time I was in Mexico, putting my isolated facts together, and feeling inclined to believe that this country had not only been inhabited in extremely remote times, when the valley bore a very different aspect from that which it now exhibits, or which tradition gives it, but that the extinct race of enormous animals, whose remains would seem, in the instance I have cited, to be coeval with the undated works of man, may have been subjected to his will, and made instrumental, by the application of their gigantic force, to the transport of those vast masses of sculptured and chiselled rock which we marvel to see lying in positions so far removed from their natural site.

"The existence of these ancient paved causeways also, not only from their solid construction over the flat and low plains of the valley, but as they may be traced running for miles over the dry table-land and the mountains, appears to me to lend plausibility to the supposition; as one might inquire, to what end the labour of such works, in a country where beasts of burden were unknown?

"But I leave this subject to wiser heads and bolder theorists. Had the Mammoth of Chapingo been discovered with a ring in his nose, or a bit in his mouth, a yoke on his head, or a crupper under his tail, the ques-

tion would have been set at rest. As it is, there is plenty of room for conjecture and dispute."*

With respect to the great extinct Mammalia of South America, we find Mr Darwin, to whom we are indebted for our knowledge of so many of them, continually expressing his wonder at the comparatively modern era of their existence. After having enumerated nine vast beasts, which he found imbedded in the beach at Bahia Blanca, within the space of 200 yards square, and remarked how numerous in kinds the ancient inhabitants of the country must have been, he observes that "this enumeration belongs to a very late tertiary period. From the bones of the *Scelidotherium*, including even the knee-cap, being entombed in their proper relative positions, and from the osseous armour of the great armadillo-like animal being so well preserved, together with the bones of one of its legs, we may feel assured that these remains were fresh and united by their ligaments when deposited in the gravel with the shells. Hence we have good evidence that the above-enumerated gigantic quadrupeds, more different from those of the present day than the oldest of the tertiary quadrupeds of Europe, lived whilst the sea was peopled with most of its present inhabitants."†

Of the remains of the Mylodon, and of that strange semi-aquatic creature the Toxodon, he says, they appeared so fresh that it was difficult to believe they had lain buried for ages under ground. The bones were so fresh, that they yielded, on careful analysis, seven per

* Latrobe's *Mexico*, p. 192. † *Nat. Voyage*, ch. v.

cent. of animal matter, and when heated in the flame of a spirit-lamp, they not only exhaled a very strong animal odour, but actually burned with a small flame.

Mr Darwin's interest was excited by the evidences everywhere present of the immensity of this extinct population. "The number of the remains imbedded in the great estuary-deposit which forms the Pampas, and covers the gigantic rocks of Banda Oriental, must be extraordinarily great. I believe a straight line drawn in any direction through the Pampas would cut through some skeleton or bones. . . . We may suppose that the whole area of the Pampas is one wide sepulchre of these extinct gigantic quadrupeds."*

The whole plain of South America from the Rio Plata to the Straits of Magellan has been raised from the sea within the species-life of the existing sea-shells, the old and weathered specimens of which, left on the surface of the plain, still partially retain their colours! Darwin infers, as certain, from data which he has adduced, that the Macrauchen, that strange giraffe-necked pachyderm, lived *long after* the sea was inhabited by its present shells, and when the vegetation of the land could not have been other than it is now. And if the Macrauchen, then the Toxodon, the Scelidothere, the Megathere, the Mylodon, the Glyptodon, the Glossothere, and all the rest of the quaint but mighty host of gone giants, that once thronged these austral plains.

Evidence for the recent existence of the colossal ostrich-

* *Nat. Voy.* ch. viii.

like birds of New Zealand is stronger still. It is about twenty-one years since the first intimation was given to scientific Europe of the remains of such animals, through some bones sent by the Rev. W. Williams to Dr Buckland. From these, and a collection soon afterwards sent home, Professor Owen established the genus *Dinornis*, identifying five species, the largest of which, *D. giganteus*, he concluded to have stood about ten feet in height. The remains have since been obtained in great profusion, and the result of further investigations by the Professor has been the establishment of three other genera, viz., *Palapteryx*, *Nestor*, and *Notornis*,—the latter a large bird allied to the Rails and Coots.

A very interesting communication from Mr Williams accompanied one of the consignments, extracts of which I will quote. It bears date "Poverty Bay, New Zealand, 17th May 1842." "It is about three years ago, on paying a visit to this coast, south of the East Cape, that the natives told me of some extraordinary monster, which they said was in existence in an inaccessible cavern on the side of a hill near the river Wairoa; and they shewed me at the same time some fragments of bone taken out of the beds of rivers, which they said belonged to this creature, to which they gave the name of *Moa*. When I came to reside in this neighbourhood I heard the same story a little enlarged; for it was said that this creature *was still existing* at the said hill, of which the name is Wakapunake, and that it is guarded by a reptile of the Lizard species, but I could not learn that any of the pre-

sent generation had seen it. I still considered the whole as an idle fable, but offered a large reward to any who would catch me either the bird or its protector." These offers procured the collection of a considerable number of fossil bones, on which Mr Williams makes the following observations:—

"1. None of these bones have been found on the dry land, but are all of them from the banks and beds of fresh-water rivers, buried only a little distance in the mud. . . . . All the streams are in immediate connexion with hills of some altitude.

"2. This bird was in existence here at no very distant time, though not in the memory of any of the inhabitants: for the bones are found in the beds of the present streams, and do not appear to have been brought into their present situation by the action of any violent rush of waters.

"3. They existed in considerable numbers,—(an observation which has since been abundantly confirmed.)

"4. It may be inferred that this bird was long-lived, and that it was many years before it attained its full size. (The writer grounds this inference on the disparity in dimensions of the corresponding bones, supposing that they all belonged to one and the same species; which, however, was an erroneous assumption.)

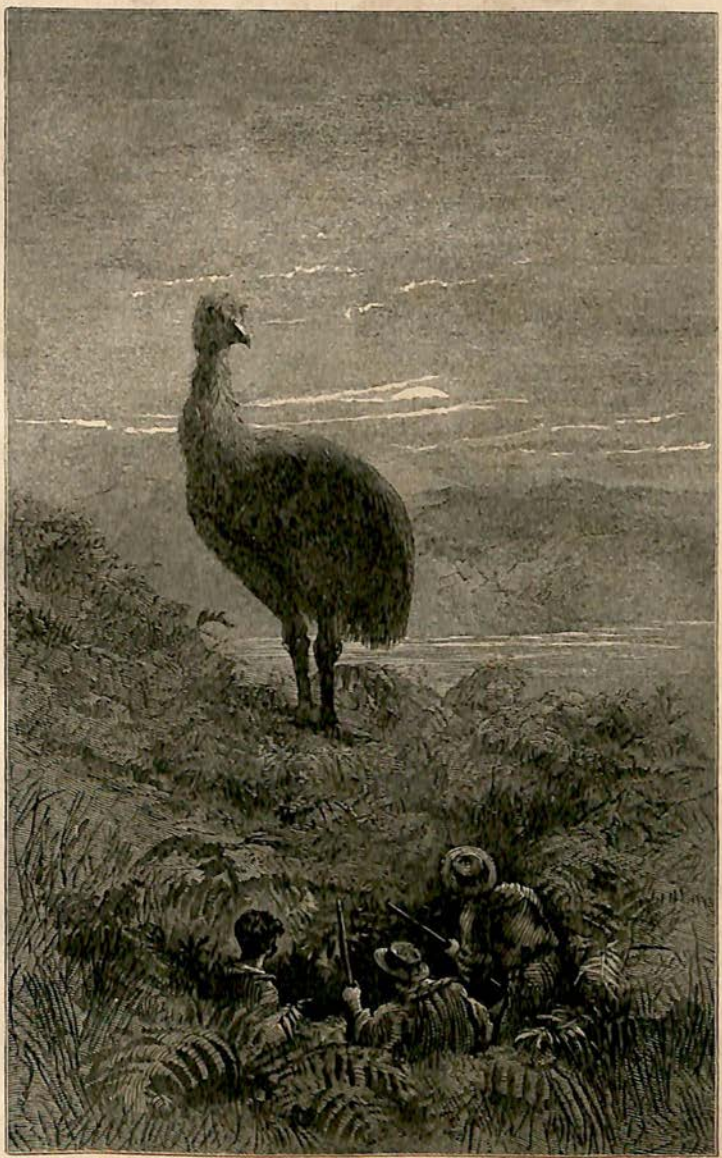
"5. The greatest height of the bird was probably not less than fourteen or sixteen feet. The leg-bones now sent give the height of six feet to the root of the tail.

"Within the last few days I have obtained a piece of information worthy of notice. Happening to speak to an

American about these bones, he told me that the bird is still in existence in the neighbourhood of Cloudy Bay, in Cook's Straits. He said that the natives there had mentioned to an Englishman belonging to a whaling party, that there was a bird of extraordinary size to be seen only at night, on the side of a hill near the place, and that he, with a native and a second Englishman, went to the spot; that, after waiting some time, they saw the creature at a little distance, which they describe as being about fourteen or sixteen feet high. One of the men proposed to go nearer and shoot, but his companion was so exceedingly terrified, or perhaps both of them, that they were satisfied with looking at the bird, when, after a little time, it took the alarm, and strode off up the side of the mountain.

"This incident might not have been worth mentioning, had it not been for the extraordinary agreement in point of the size of the bird [with my deductions from the bones]. *Here* are the bones which will satisfy you that such a bird *has been* in existence; and *there* is said to be the *living bird*, the supposed size of which, given by an independent witness, precisely agrees."

The story told of the whaler appears to me to bear marks of truth. The bold essay to explore, the terror inspired by the gigantic figure, especially in the solemnity of night, the description of the manners of the bird running and striding, so like those of the Apteryx, with which its bones shew the Moa to have been closely allied, and the inglorious return of the party without achieving any



ENCOUNTER WITH A MOA.

exploit, are all too natural to permit the thought that no more than inventive power has been at work.

And well may the colossus have inspired fear. The bones sent to London greatly exceed in bulk those of the largest horse. The leg-bone of a tall man is about one foot four inches in length, and the thigh of O'Brien, the Irish giant, whose skeleton, eight feet high, is mounted in the Museum of the Royal College of Surgeons, is not quite two feet. But the leg-bone (*tibia*) of the *Dinornis* we know measured as much as two feet ten inches, and we have no reason to suppose, considering the disparity that exists in the specimens examined, that we have seen by any means the largest.

Additional reason for supposing these magnificent birds to have existed not long ago, is found in the fact that specimens of their eggs have been preserved. The circumstances attendant on the discovery and identification of these possess a remarkable interest. In the volcanic sand of New Zealand Mr Walter Mantell found a gigantic egg, which we may reasonably infer to be that of either *Dinornis* or *Palapteryx*, of the magnitude of which he gives us a familiar idea by saying that his hat would have been but just large enough to have served as an egg-cup for it. This is the statement of a man of science, and therefore we may assume an approximate degree of precision in the comparison.

I do not know the size of Mr Mantell's hat, but I find that the transverse diameter of my own is six inches or a little more. If we may take this as the shorter diameter

of the ovoid, the longer would probably be about eight and a half inches; dimensions considerably greater than those of the Ostrich's egg (which are about six and a quarter in length), but not what we should have expected from a bird from twelve to fourteen feet in height. And this the rather when we consider that the egg of the New Zealand *Apteryx*, to which these birds manifest a very close affinity, is one of dimensions that are quite surprising in proportion to the bulk of the bird. The Apteryx is about as big as a turkey, standing two feet in height, but its egg measures four inches ten lines by three inches two lines in the respective diameters. The egg of the *Dinornis giganteus*, to bear the same ratio to the bird as this, would be of the incredible length of two feet and a half, by a breadth of one and three quarters! Possibly this specimen, though indubitably the egg of one of this great family of extinct birds, may after all be that of one of the subordinate species.

But about the same time as Mr Mantell's discovery, one of equal interest was made in Madagascar. The master of a French ship obtained, in 1850, from natives of the island, three eggs, of far greater size, and fragments of the leg-bones of an immense bird. These, on their arrival at Paris, formed the subjects of valuable investigations by M. Isidore Geoffroy St Hilaire* and Professor Owen.†

The native statement was, that one of the eggs had been found entire in the bed of a torrent, among the debris of a land-slip; that a second egg, with some frag-

* *Comptu Rendus*, Jan. 27, 1851. † *Proc. Zool. Soc.*, Jan. 27, 1852.

ments of bone, was subsequently found in a formation *which is stated to be alluvial;* a third egg, which the natives had perforated at one end, and used as a vessel, was also found. This last egg was broken in the carriage, the other two arrived in Europe entire.

These two, though nearly alike in size, differed considerably in their relative proportions and shape, the one being shorter and thicker, with more equal ends than the other. The following table shews the dimensions of both compared with those of an ostrich's egg:—

	Ovoid egg.			Ellipsoid egg.			Ostrich egg.		
	ft.	in.	li.	ft.	in.	li.	ft.	in.	li.
Longer circumference	2	10	9	2	9	6	1	6	0
Shorter circumference	2	4	3	2	5	6	1	4	6
Extreme length	1	0	8	1	0	5	0	6	4

M. Geoffroy St Hilaire estimates the larger of the two to contain $10\frac{1}{8}$ quarts, or the contents of nearly six eggs of the Ostrich, or sixteen of the Cassowary, or a hundred and forty-eight of the Hen, or fifty thousand of the Humming bird.*

The fragments of bone indicated a bird of the same natural affinities as the New Zealand colossi, and of dimensions not widely remote from theirs. Professor Owen thinks that it did not exceed in height or size *Dinornis giganteus,* and that there is a probability that it was slightly smaller. The Madagascar bird has been named *Æpyornis maximus.*

* "*The* Humming-bird." Rather a vague mode of speaking, by a zoologist, of a genus which numbers more than three hundred species, varying in size from that of a swallow to that of a humble-bee. But probably he means one of the minuter species.

The fragments of the egg of the New Zealand bird (still uncertain as to the species to which it is to be referred) shew that the shell was absolutely thinner, and therefore relatively *much* thinner than that of the Ostrich's egg; the air-pores, too, have a different form, being linear, instead of round, and the surface is smoother. In these qualities, the New Zealand egg resembles that of the *Apteryx;* in the thickness and roughness of the egg of *Æpyornis* there is more similarity to those of the Ostrich and Cassowary. The colour of the Madagascar egg is a dull greyish yellow; but it is possible that this may be derived from the soil in which it has long been imbedded. The fragments of the New Zealand egg are white, like the eggs of the Apteryx and Ostrich: those of the Emu and Cassowary are light green.

The willing fancy suggests the possibility that, in an island of such immensity as Madagascar, possessing lofty mountain-ranges, covered with the most magnificent forests, where civilised man has only yet touched one or two spots on the seaward borders, but where these slight explorations have educed so many wondrous animals, so many strange forms of vegetable life, the noble *Æpyornis* may yet be stalking with giant stride along the fern-fringed hill-sides, or through the steaming thickets; though in the more contracted area of New Zealand its equally ponderous cousins, the *Dinornis* and the *Palapteryx*, may have sunk beneath the persevering persecutions of man.

Yet another item of evidence bearing on the recent if

not present existence of these great fowls has recently come to light:—the most interesting discovery that one of the genera whose fossil remains had been found associated with theirs is really extant in New Zealand. I refer to the *Notornis*.

At a meeting of the Zoological Society of London, held on the 13th November 1850, Dr Mantell made the following communication relative to this discovery:—

"It was in the course of last year, on the occasion of my son's second visit to the south of the middle island, that he had the good fortune to secure the recent Notornis, which I now submit, having previously placed it in the hands of the eminent ornithologist Mr Gould, to figure and describe. This bird was taken by some sealers who were pursuing their avocations in Dusky Bay. Perceiving the trail of a large and unknown bird on the snow, with which the ground was then covered, they followed the footprints till they obtained a sight of the *Notornis*, which their dogs instantly pursued, and, after a long chase, caught alive in the gully of a sound behind Resolution Island. It ran with great speed, and on being captured uttered loud screams, and fought and struggled violently. It was kept alive three or four days on board the schooner, and then killed, and the body roasted and eaten by the crew, each partaking of the dainty, which was declared to be delicious. The beak and legs were of a bright red colour. My son secured the skin, together with very fine specimens of the Kapapo or ground parrot (*Strigops*), a pair of Huias (*Neomorpha*), and two species of Kiwikiwi,

namely *Apteryx Australis*, and *A. Oweni*. The latter very rare bird is now added to the collection of the British Museum."

"Mr Walter Mantell states, that, according to the native traditions, a large Rail was contemporary with the Moa, and formed a principal article of food among their ancestors. It was known to the North Islanders by the name 'Moho,' and to the South Islanders by that of 'Takahe;' but the bird was considered by both natives and Europeans to have been long since exterminated by the wild cats and dogs; not an individual having been seen or heard of since the arrival of the English colonists. On comparing the head of the bird with the fossil cranium, and mandibles, and the figures and descriptions in the 'Zoological Transactions' (Plate lvi.), my son was at once convinced of their identity. It may not be irrelevant to add, that in the course of Mr Walter Mantell's journey from Banks's Peninsula along the coast to Otago, he learned from the natives that they believed there still existed in that country the only indigenous terrestrial quadruped, except a species of rat, which there are any reasonable grounds for concluding New Zealand ever possessed. While encamping at Arowenua, in the district of Timaru, the Maoris assured them that about ten miles inland there was a quadruped which they called Káúreke, and that it was formerly abundant, and often kept by their ancestors in a domestic state as a pet animal. It was described as about two feet in length, with coarse grizzly hair; and must have more nearly resembled the

otter or badger than the beaver or the Ornithorhynchus, which the first accounts seem to suggest as the probable type. The offer of a liberal reward induced some of the Maoris to start for the interior of the country where the Káureke was supposed to be located; but they returned without having obtained the slightest trace of the existence of such an animal. My son, however, expresses his belief in the native accounts, and that, if the creature no longer exists, its extermination is of very recent date. In concluding this brief narrative of the discovery of a genus of birds once contemporary with the colossal Moa, and hitherto only known by its fossil remains, I beg to remark that this highly interesting fact tends to confirm the conclusions expressed in my communication to the Geological Society, namely, that the *Dinornis, Palapteryx,* and related forms, were coeval with some of the existing species of birds peculiar to New Zealand, and that their final extinction took place at no very distant period, and long after the advent of the aboriginal Maoris."

Mr Gould then read a paper pointing out the zoological characters of the bird discovered by Mr Mantell, which he had no hesitation in identifying as the species formerly characterised, from its osseous remains, by Professor Owen, under the name of *Notornis Mantelli.* Mr Gould, in adverting to the extreme interest with which the present existence of a species which was certainly contemporary with the Moa must be regarded, pointed out, from the preserved skin, which was on the table, how accurate a prevision of its character had been made by Professor

Owen, when investigating the fragments from which our first knowledge of it had been derived.*

At length I come home to Great Britain and Ireland—the "nice little, tight little islands" where so many of our sympathies properly centre, where natural-history facts and all other facts interest us so much more than parallel facts elsewhere, and where, above all, there are so many more lights streaming into the darkness, and bringing out truth. Let us again look back to the period of the Bison, and Reindeer, and Elk, of the Elephant, and Hippopotamus, and Rhinoceros, of the Lion and the Hyena, and the great Cave Bear, and search among the vanishing traces of the far past for glimpses of evidence when their age ceased to be.

Some dim light falls on the obscurity from the discovery of the fossil remains of man himself—the human bones found by Dr Schmerling in a cavern near Liege, the remains mentioned by M. Marcel de Serres and others in several caverns in France, associated with fossil relics of this period. But more from the occurrence of flints, apparently fashioned by human art, in superficial deposits, together with the same extinct fossils of the tertiary. Even at the very moment that I write this sheet, my eye falls on the report† of an important meeting of the Ethnological Society, for the purpose of discussing this very subject of "The flint implements found associated with the bones of extinct animals in the Drift." Many

* *Proc. Zool. Soc.*, Nov. 7, 1850.

† In the *Times* of Feb. 21, 1861.

of the leading geologists and archæologists were present, for the matter has become one of absorbing interest, conflicting, as the facts seem to do, with some assumptions received as unquestioned verities in Geology.

These flints, which seem indubitably to have been chipped into the forms of arrow-heads, lance-heads, and the like, have been found in France in large numbers, as also in other parts of the continent, and in England. They resemble those still used by some savage tribes. In this very neighbourhood, as in the cavern called Kent's Hole near Torquay, and in one more recently examined at Brixham, they are found mixed up with the bones of the Rhinoceros, of the Cave Bear, and the Hyena. At Menchecourt, near Abbeville, they occur in a deposit of sand, sandy clay, and marl, with bones of the same animals, and others, their contemporaries. Concerning this bed, Mr Prestwich, in a paper read before the Royal Society, May 26, 1859, says that it must be referred to those usually designated as post pliocene, but that the period of its deposit was anterior to that of the surface assuming its present outline, so far as some of its minor features are concerned. "He does not, however, consider that the facts of necessity carry man back in past time more than they *bring forward the great extinct mammals towards our own time*, the evidence having reference only to relative, and not to absolute time; and he is of opinion that many of the later geological changes may have been sudden, or of shorter duration than generally considered. In fact, from the evidence here exhibited, and from all that he

knows regarding the drift phenomena generally, the author sees no reason against the conclusion that this period of man and the extinct mammals—supposing their contemporaneity to be proved—was brought to a sudden end by a temporary inundation of the land; on the contrary, he sees much to support such a view on purely geological considerations." *

At the meeting of the Ethnological Society just held, there seems to have been an increasing tendency to admit the hypothesis of the continuance of the Mammalia of the Tertiary into the human era. Mr Evans, who exhibited specimens taken at a depth of twenty to thirty feet, from a stratum of coarse fresh-water gravel, lying on chalk, and containing an entire skeleton of an extinct Rhinoceros, and overlaid by sandy marl containing existing shells, shewed that the deposit had certainly not been disturbed till the present time, so that the gravel, the bones, and the flints had been deposited coetaneously. He suggested "that the animals supposed to have become extinct before man was created might have continued to exist to more recent periods than had been admitted." And this opinion found support from other leading geologists.

That this conclusion would throw the existence of man to an era far higher than that assigned to him by the inspired Word, is, I know, generally held; and certain investigations, made in the alluvial deposit of the Nile,† are considered to prove that man has been living in a state of comparative civilisation in the Nile Valley for

* *Proc. Roy. Soc.*, X. xxxv. 50. † *Ibid.* IX. xxix. 133.

the last 13,500 years. But that conclusion absolutely rests on the supposition that the rate of increase formed by the annual deposit of the Nile mud has been always exactly the same as now,—a supposition, not only without the least shadow of proof, but also directly contrary to the highest probability, nay, certainty, in the estimation of those who believe in the Noachian deluge. For surely the drainage of the entire plain of North Africa after that inundation must have produced an alluvium of vast thickness in a very brief time; while beneath that deposit the works of the antediluvian world might well be buried. Yet the possibility of there ever having been any greater rate of deposit than within the last 3000 years, the recorder of those investigations, in his unseemly haste to prove the Bible false, strangely leaves wholly out of his consideration.

So, doubtless, concerning other deposits containing fossil remains, whose extreme antiquity is assumed from the known rate of surface-increase now, we ought to remember that we have not a tittle of proof that the rate of increase has not at certain remote periods been suddenly and immensely augmented. There are many facts on record which tend to shew that the rate at which geologic changes take place in certain localities affords no reliable data whatever to infer that at which phenomena apparently quite parallel have occurred in other localities. An upheaval or a subsidence of one part of a country may rapidly effect a great change in the amount of soil or gravel precipitated by streams, without destroying or changing their channels, and yet the deposit may be

made sufficiently gradually to allow the burial of shells or of bones of creatures which lived and died on the spot.

The degradation of a cliff, either suddenly or gradually, might throw a vast quantity of fragments into a rapid stream, and cause a deposit of gravel of considerable breadth and thickness in a comparatively short period of time,—say a century or two.

Sir Charles Lyell has adduced examples of very rapid formation of certain stony deposits, which should make us cautious how we assert that such and such a thickness *must* have required a vast number of years. In one of them there is a thickness of 200 or 300 feet of travertine of recent deposit, while in another, a solid mass *thirty feet thick was deposited in about twenty years.* There are countless places in Italy where the formation of limestone may be seen, as also in Auvergne and other volcanic districts.*

From these and similar considerations it seems to me by no means unreasonable that the four thousand years which elapsed between the Creation and the commencement of Western European history should have been amply sufficient for many of those geological operations whose results are seen in what are known as the later Tertiary deposits,—the crag, the drift, the cavern-accumu-

* Because comparatively few readers, and especially the critics, will take the trouble to ascertain what an author really means if he attempt argumentation, generally supposing him to be proving something else than he propounds to himself, it may be needful to say, that I am not touching the question of the time required for the formation of the stratified rocks in general, but solely for that of the later Tertiary deposits.

lations, and the like. And, as a corollary to this, that the great extinct Mammalia may have extended into this period, and thus have been contemporary with man, for a greater or less duration, according to the species; some, probably, having been extinguished at a very early period of the era, while others lived on to the time I have named, or even later.

But have we nothing better for this conclusion than an assumption of the possibility, and a more or less probable conjecture? Yes; we have some facts of interest to warrant it, or I should not have ventured to introduce the subject in this work. There are facts,—besides the admixture of human workmanship with the animal remains in undisturbed deposits — direct evidence, not altogether shadowy, of the co-existence of the extinct animals with living men.

And first, I would mention some circumstances bearing analogy to the exhumation of the fresh Pachyderms of Siberia. Some years ago, a portion of the leg of an Irish Elk, so-called, (*Megaceros hibernicus,*) with a part of the tendons, skin, and hair upon it, was dug up with other remains from a deposit on the estate of H. Grogan Morgan, Esq., of Johnstown Castle, Wexford, and is now in that gentleman's possession. This leg was exhibited, and formed the subject of a lecture at the time by Mr Peile, veterinary surgeon, Dublin.

It has been ascertained that the marrow in some of the bones blazes like a candle; that the cartilage and gelatine, so far from having been destroyed, were not appar-

ently altered by time.* Archdeacon Maunsell actually made soup of the bones, and presented a portion thereof to the Royal Dublin Society (whether they enjoyed it I have not heard; it must have been "a little high," I fear). They are frequently used by the peasantry for fuel. On the occasion of the rejoicings for the victory at Waterloo, a bonfire was made of these bones, and it was observed that they gave out as good a blaze as those of horses, often used for similar purposes.†

Pepper, in his "History of Ireland," states that the ancient Irish used to hunt a very large black deer, the milk of which they used as we do that of the cow, and the flesh of which served them for food, and the skin for clothing. This is a very remarkable record; and is confirmed by some bronze tablets found by Sir William Betham, the inscriptions on which attested that the ancient Irish fed upon the milk and flesh of a great black deer.

According to the "Annals of the Four Masters," Niel Sedamin, a king of Ireland before the Christian era, was so called because "the cows and the female deer were alike milked in his reign." The art of taming the wild deer and converting them into domestic cattle is said to have been introduced by Flidisia, this monarch's mother. Deer are said to have been used to carry stones and wood for Codocus when his monastery was built, as also to carry timber to build the castle of a king of Connaught. These

* *Reports of Analysis*, by Apjohn.

† Hart *On the Fossil Deer.*

may have been red deer, but as there is good proof that the giant deer was really domesticated, it seems more likely that such offices should have been performed by the latter than by the former.

An interesting letter from the Countess of Moira, published in the "Archæologia Britannica," gives an account of a human body found in gravel under eleven feet of peat, soaked in the bog-water; it was in good preservation, and completely clothed in antique garments of deer-hair, conjectured to be that of the Giant Elk.

A skull of the same animal has been discovered in Germany in an ancient drain, together with several urns and stone-hatchets. And in the museum of the Royal Dublin Society there exists a fossil rib bearing evident token of having been wounded by some sharp instrument which remained long infixed in the wound, but had not penetrated so deep as to destroy the creature's life. It was such a wound as the head of an arrow, whether of flint or of metal, would produce.

In the year 1846, a very interesting corroboration of the opinion long held by some that the great broad-horned Deer was domesticated by the ancient Irish, was given by the discovery of a vast collection of bones at Lough Gûr, near Limerick. The word Gûr is said to mean "an assemblage," so that the locality is "the Lake of the Assemblage," commemorating perhaps the gathering of an army or some other host at the spot. In the midst of the lake is an island, which is described as being so completely surrounded with bones and skulls of animals "that one

would think the cattle of an entire nation must have been slaughtered to procure so vast an assemblage."

The skulls are described as belonging to the following animals:—The giant deer (females); a deer of inferior size; the stag; another species of stag; the fallow deer; the broad-faced ox; the hollow-faced ox; the long-faced ox; another species of ox; the common short-horned ox; the goat; and the hog.

The principal points of interest centred in the Giant Deer or so-called Irish Elk. The skulls of these, as of all the larger animals, "were broken in by some sharp and heavy instrument, and in the same manner as butchers of the present day slaughter cattle for our markets, and in many cases the marrow-bones were broken across, as if to get at the marrow."

Of course, if this was indubitable, the conclusion was inevitable, that the Giant Deer was not only contemporary with man, but was domesticated by him with other quadrupeds, and used for food. Professor Owen, however, contended that the skulls of the Giant Deer were not females but males, from which the horns had been forcibly removed, and that the holes in the foreheads were made by the violent wrenching off of the horns tearing away a portion of the frontal bone from which they grew.

In reply to this opinion, Mr H. D. Richardson of Dublin, whose personal acquaintance with the relics of this noble species is peculiarly extensive, shewed that certain variations of proportion on which the learned Professor relied to prove the skulls to be male, were of

no such value, individual animals presenting great discrepancies in these respects: that the total absence of cornuous peduncles from the sides of the forehead, and of the elevated bony ridge, conclusively proved the sex to be female, which was permanently destitute of horns; and that in no case could it be said that the ridge was forced away, since the violence was confined to a *small hole* in the centre of the forehead.

To put the matter to test, Mr Richardson experimented on two perfect male skulls. In the one instance the force was applied to the beam of the horns, and the result was their fracture where they are united to the peduncles. In the other case the force was applied to the peduncles themselves, to ascertain whether it was possible to wrench them and the ridge away from the face, when the consequence was, that the skull was completely riven asunder. Indeed to any one who looks at the position of the horns in this animal, and their implantation, it must be self-evident that their violent removal must tear away the entire forehead, and not leave a central hole. Mr Edward Newman who subsequently examined the specimens speaks decidedly on this point:—"I have not the least hesitation in expressing my firm conviction that the fractures were the result of human hands, and were the cause of the death of the animals. These two fractured skulls correspond too exactly with each other, and with that of a bullock with which I compared them, to have resulted from accident: the edges of the fractures wore the appearance of having been coeval with the interment or

submergence of the skulls, and presented a very strikingly different appearance from a fracture recently made, and which I had the opportunity of examining. There were several skulls of the male of the same species, one bearing enormous antlers, but none exhibiting the slightest trace of frontal fracture." *

A circumstance of much importance is that these skulls were found in company with those of many well-known domestic animals, as the ox, the goat, and the hog. *These skulls were similarly fractured.* As it is evident that *their* demolition was produced by the butcher's pole-axe, why not that of the elk-skulls?

"At the first cursory glance, it may appear somewhat strange that the skulls of the males should invariably have been found entire, and that even the recent discovery at Lough Gûr should form no exception.

"I do not, however, find any difficulty here. In the first place, we may fairly suppose that males, like our bulls, were not equally prized as food. In the second place, the size, as well as the position of the antlers, would render it next to an impossibility to give the desired blow with the pole-axe. In the third place, the greater strength and thickness of the skull would almost to a certainty render the blow unavailing; and in the fourth place, supposing the females domesticated, and the occasional tenants of sheds and other buildings, we may well imagine that the males were excluded from such buildings by the enormous size of their antlers. Perhaps a few only of the males, as in

* *Zoologist*, for 1846: Preface, p. 10.

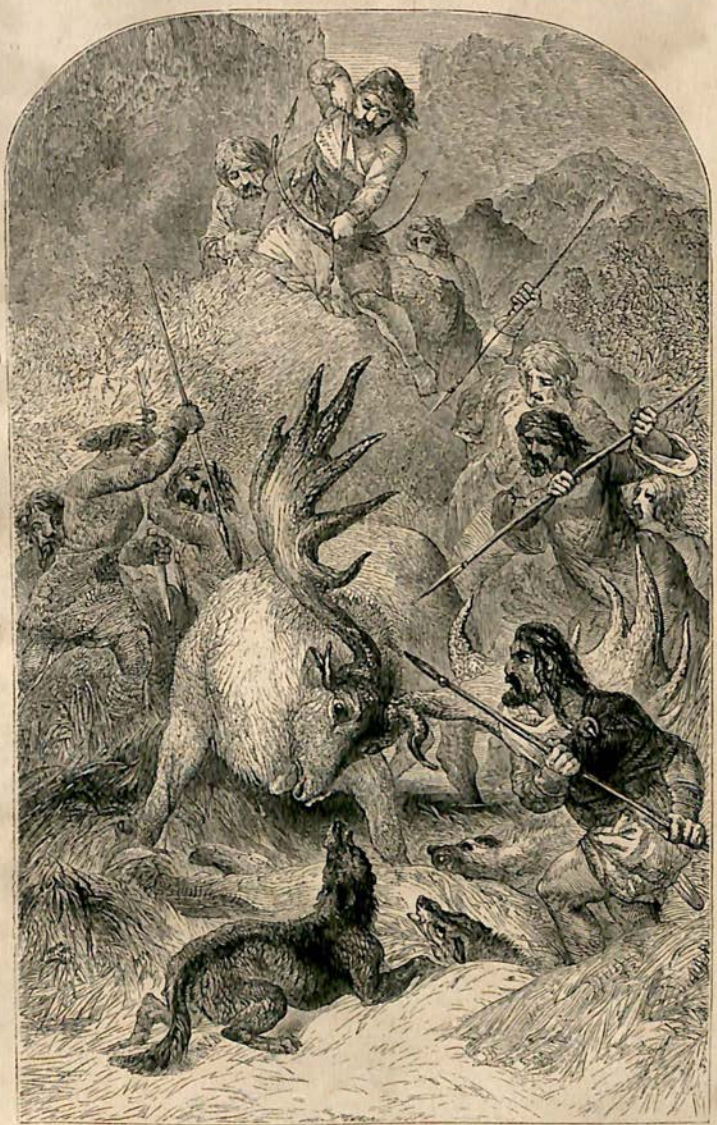
our cattle, were suffered to become adult, one male sufficing for many females. Perhaps the males were allowed free range, the females only being permitted at stated seasons to accompany them. In fine, the more we investigate probabilities, the more we reason from present experience and knowledge, the less difficulty shall we find in the way of believing the gigantic deer of Ireland an animal coeval with man and subservient to his uses." *

In a communication subsequently made to the *Zoologist* by Mr Richardson, he gives the following additional evidence:—"In the collection of the late Mr Johnston, of Down, which had been left by his uncle, an attorney, and in which everything was labelled with the accuracy and precision of that profession, is a small brass spear, with a piece of wood still in the socket, with a label, stating it to have been found in a marl-pit, among the bones of a deer. An excise-officer told me that he saw, found in a marl-pit, at Mentrim in Meath, the skeleton of a deer, and a man, and a long knife: the latter, I believe, is rather a short sword, now, I think, in the collection of Mr Petrie, of Dublin, who told me that some such tradition had accompanied it into his possession. . . . Dr Martin informs me that on the banks of the river Suir, near Portland, Waterford, and on nearly every farm, are found, near springs, spaces of frequently seventy feet in diameter, consisting of stones, broken up as if for roads, and lying together in a mass. These stones were evidently purposely broken,

* Mr Newman, *op. cit.* x.

and all much of one size, and are charred. These spaces are many feet in depth. The tradition respecting them is current among the peasantry, that here in olden time, a great deer was killed and baked in these stone-pits, the stones having been previously heated like a kiln, and they also distinguish the animal as the 'Irish Elk.' These places are called in Irish by a name signifying the 'Buck's Den.'"

From all these testimonies combined, can we hesitate a moment in believing that the Giant Deer was an inhabitant of Ireland since its colonisation by man? It seems to me that its extinction cannot have taken place more than a thousand years ago. Perhaps at the very time that Cæsar invaded Britain the Celts in the sister isle were milking and slaughtering their female elks, domesticated in their cattlepens of granite, and hunting the proud-antlered male with their flint arrows and lances. It would appear, that the mode of hunting him was to chase and terrify him into pools and swamps, such as the marl-pits then were; that, having thus disabled him in the yielding bogs, and slain him, the head was cut off, as of too little value to be worth the trouble of dragging home; that the under jaws and tongue were cut off; and that frequently the entire carcase was disjointed on the spot, the best parts only being removed. This would account for the so frequent occurrence of separate portions of the skeleton, and especially of skulls, in the bog-earth. No doubt so large an animal would not long survive in a state of freedom, after an island so limited in extent as Ireland became



SPEARING THE ANCIENT ELK.

peopled throughout; and supposing the females to have been domesticated, it is quite conceivable that the difficulty or even danger of capturing or domesticating the males, may have caused the species soon to become extinct in captivity, when it no longer continued to exist in a wild state. Thus we may perhaps account for the certainly remarkable fact that no native Irish name has been recognised as belonging to it;—remarkable, because the Irish tongue is particularly rich in distinctive names for natural objects. There exists a very curious ancient poem in that language which professes to enumerate the whole fauna of the island. It is founded on the legend that Fian MacCumhaill was made prisoner by Cormac MacArt, king of Erinn; that the victor promised to give him freedom on condition that, as a ransom, a pair of each wild animal found in Ireland were brought before him on the green of Tara. Cailte MacRonain, the foster-brother of the captive general undertook the task, and succeeded in bringing the collection before the king within a twelvemonth; and in the poem, he is supposed to narrate to St Patrick the detail and result of his enterprise. Of this poem, which is considered to be as early as the ninth century, the reader may like to see the following translation by Mr Eugene Curry, containing the zoological portion:—

"I then went forth to search the lands,
To see if I could redeem my chief,
And soon returned to noble Tara,
With the ransom that Cormac required.

"I brought with me the fierce *Geilt*,*
And the tall *Grib* † with talons,
And the two Ravens of Fid-dá-Beann,
And the two Ducks of Loch Saileann.

"Two Foxes from Sliabh Cuilinn,
Two Wild Oxen ‡ from Burren,
Two Swans from the dark wood of Gabhran,
And two Cuckoos from the wood of Fordrum.

"Two *Toghmalls* § from Fidh-Gaibhle,
Which is by the side of the two roads,
And two Otters after them,
From the brown-white rock of Dobhar.

"Two Gulls from Tralee hither,
Two *Ruilechs* ‖ from Port Lairge (Waterford),
Four *Snags* ¶ from the River Brosna,
Two Plovers from the rock of Dunán.

---

* *Geilt.*—According to O'Reilly, this word means "a wild man or woman,—one living in woods,"—a maniac. It may, however, have been figuratively applied to some very fierce or untameable creature, either quadruped or bird, which inhabited the woods. But that the *Simiæ*, or monkey tribe, were not likely to have at any time inhabited so cold a country, one would have seen in the term an exceedingly apt expression for "the wild man of the woods." (Note by Translator.)

But, I venture to remind the reader, there was a veritable ape found in Britain during the very era of the Giant Deer, and of many of the now extant animals. I refer to the *Macacus pliocænus* (Owen) of the fresh-water deposits. Is it not just possible that the *Geilt* of Ireland, the first-named animal in the poem, may have been this species? A *Macacus* still lingers in Europe, though the elephants and hippopotamuses have long deserted us.

† *Grib.*—Probably the Osprey.

‡ These Wild Oxen are worthy of notice.

§ The *Toghmall* was a bird kept as a pet. "When Cuchulain slung a stone at Queen Meave he killed the Toghmall that was sitting on her shoulder."

‖ *Ruilech.*—Unknown.

¶ *Snag.*—Probably the Crane, or one of the Heron tribe.

'Two *Echtachs** from the lofty Echtghe,
Two Thrushes from Letter Longarie,
Two *Drenns*† from Dun Aife,
The two *Cainches*‡ of Corraivte.

"Two Herons from the hilly Corann,
The two *Errfiachs*§ of Magh Fobhair,
The two Eagles of Carrick-na-Cloch,
Two Hawks from the wood of Caenach.

"Two Pheasants from Loch Meilge,
Two Water-hens from Loch Eirne,
Two Heath-hens from the Bog of Mafa,
Two Swift Divers from Dubh Loch.

"Two *Cricharans*‖ from Cualann,
Two Titmice from Magh Tualang,
Two Choughs from Gleann Gaibhle,
Two Sparrows from the Shannon.

"Two Cormorants from Ath Cliath,
Two *Onchus*¶ from Crotta Cliach,
Two Jackdaws from Druim Damh,
Two *Riabhogs*** from Leathan Mhaigh.

"Two Rabbits from Dumho Duinn,
Two wild Hogs from circular Cnoghbha,

---

* *Echtach*.—From a legend attached to the locality, there is a possibility that these were a peculiar breed of horned cattle.

† *Drenn*.—Probably the Wren.

‡ *Cainche*—§ *Errfiach*.—Both unknown.

‖ *Cricharan*.—Possibly the Squirrel, or the Marten.

¶ Mr Curry says, "In the dictionaries *Ormchre* is the term for a leopard, but that animal did not exist in Ireland." But the caves of Britain shew that very formidable *Felidæ* roamed here in the Later Tertiary Era.

** *Riabhog*.—The "cuckoo's waiting-maid," a little bird, is still so called in the west of Ireland. In England the wryneck (*Yunx torquilla*) bears this office, and also in Wales, where Pennant says it is called *Gwás y gog*, which means the same thing.

Two *Peatâns* * from Creat Roe,
Two wild Boars† from green-sided Tara.

"Two Pigeons out of Ceis Corann,
Two Blackbirds out of Leitir Finnchoill,
Two black Birds (?) from the strand of Dabhan,
Two Roebucks from Luachair Deaghaidh.

"Two *Fereidhins*‡ from Ath Loich,
Two Fawns from Moin mor,
Two Bats out of the Cave of Cnoghbha,
Two Pigs§ from the lands of Ollarbha.

"Two Swallows out of Sidh Buidhe,
Two *Iaronns*‖ from the wood of Luadraidh,
Two *Geisechtachs*¶ from Magh Mall,
Two charming Robins from Cnamh Choill.

"Two Woodcocks from Coillruadh,
Two Crows from Lenn Uar,
Two *Bruacharans*** from Sliabh-da-Ean,
Two Barnacle-Geese from Turloch Bruigheoil.

"Two *Naescans*†† from Dun Daighre,
Two Yellow-ammers from the brink of Bairne,
Two *Spireogs*‡‡ from Sliabh Cleath,
Two Grey Mice from Limerick.

---

* *Peatans.*—Conjectured to be Leverets.

† What is the difference between wild Boars and wild Hogs? The ransom, too, was to consist of a male and a *female* of each kind of *wild* animals.

‡ *Fereidhin.*—Unknown.

§ See note † *supra.*

‖ *Iaronn.*—Unknown.

¶ *Geisechtachs.*—"Screamers;"—perhaps Peacocks. But is it likely that the Peacock and the Pheasant (*vide supra*) were imported from the East so early?

** *Bruacharan.*—Unknown.

†† *Naescan.*—The Snipe may be meant.

‡‡ The term *Spireog* is still used in the locality referred to, and signifies the Sparrowhawk. It has, however, somewhat of a Saxon sound.

"Two Cornerakes from the Banks of Shannon,
Two Wagtails from the brinks of Birra,
Two Curlews from the Harbour of Galway,
Two *Sgreachógs* * from Muirtheimhne.

"Two *Geilt Glinnes* † from Glenn-a-Smoil,
Two Jackdaws from great Ath Mogha,
Two fleet *Onchus* ‡ from Loch Con,
Two Cats out of the Cave of Cruachain.

"Two Goats from Sith Gabhran,
Two Pigs § of the Pigs of Mac Lir,
A Ram and Ewe both round and red,
I brought with me from Aengus.

"I brought with me a Stallion and a Mare,
From the beautiful stud of Manannan,
A Bull and a white Cow from Druim Cain,
Which were given me by Muirn Munchain.

No *known* allusion occurs in this poem to the Giant Deer.‖ First, however, we must remember that no small

* *Sgreachóg.*—Conjecturally, Screech-owl; or Jay.

† *Geilt Glinne.*—See note * on p. 58.

‡ The *Onchu* has been mentioned before. See note ¶ on p. 59. There were several kindred *Felidæ* in the Pliocene period. May the word refer to two of these bearing the same name, but the one distinguished by the term *fleet?*

§ "*Pigs*" again! This is the fourth time. "Wild Hogs, wild Boars, Pigs, and yet Pigs." From the prominence thus given to the grunting race in the ransom, one is tempted to conclude that "'Twas the Pig that paid the rint," then, as now!

‖ Mr Wilde, in an interesting paper "On the Unmanufactured Animal Remains belonging to the Royal Irish Academy," read before the Academy on the 9th and 25th of May, 1859, to which I am indebted for the foregoing poem, cites the following legend, which we might have referred to the *Megaceros*, but that he appears to consider the animal in question the Red Deer or Stag:—"On another occasion

number of the animals mentioned are quite unrecognisable; and that of those names to which an explanation is given, many are probably incorrectly rendered. Secondly, if it could be absolutely shewn that no allusion exists to that fine beast, it would not at all disprove its existence a thousand years before. Supposing that the *Megaceros* became extinct soon after the colonisation of Ireland, and that this was several centuries before the Christian era, the distinctive name by which it had been known might well have died out and become extinct also, among a people unacquainted with letters. Or if a dim tradition of the animal and of its name still lingered here and there, it might well be omitted from a catalogue which professed to give the creatures actually collected in a living state at a given period. It would have been interesting to have

St Patrick and his retinue, with Cailte MacRonain, came to the house of a rich landholder who lived in the southern part of the present County of Kildare, near the river Slaney. The farmer complained to Cailte that although he sowed a great quantity of corn every year, it yielded him no profit, on account of *a huge wild Deer* which every year came across the Slaney from the west when the corn was ripe for cutting, and, rushing through it in all directions, trampled it down under his feet. Cailte undertook to relieve him, and he sent into Munster for his seven deer-nets, which arrived in due time. He then went out and placed his men and his hounds in the paths through which the great deer was accustomed to pass, and he set his deer-nets upon the cliffs, passes, and rivers around, and when he saw the animal coming to the Ford of the Red Deer on the river Slaney, he took his spear and cast a fortunate throw at him, driving it the length of a man's arm out through the opposite side; and 'The Red Ford of the Great Deer' is the name of that pass on the Slaney ever since; and they brought him back to Drom Lethan, or 'The Broad Hill,' which is called 'The Broad Hill of the Great Wild Deer.'"

been able to identify the Great Elk, but its introduction would have been a glaring anachronism.

The enumeration of nearly a hundred and sixty quadrupeds and birds either indigenous to or naturalised in Ireland at so early a period, possesses, I say, a peculiar interest.

If the editor's suggestion is correct, that the *Echtach* was a bovine animal, then we have three distinct mentions of this family in the poem,—the Wild Oxen, the Echtachs, and the Bull and White Cow. The second and third of these were probably domesticated animals; the first one expressly "Wild." Now at least five distinct species of Oxen are known to have inhabited Europe and the British Isles during the later periods of the Tertiary era, which have been named respectively, *Bison priscus, Bos primigenius, frontosus* and *longifrons*, and *Ovibos moschatus*. Of these, skulls of *Bos frontosus* and *B. longifrons* have been dug up in some numbers in Ireland. Some of these bear, in the perforation of the forehead, evident proof of having been slaughtered *secundum artem*, and therefore of having been domesticated. But one large skull of the *longifrons* type, now in the Museum of the Royal Irish Academy, has a cut in the forehead, into which can be accurately fitted several of the narrow bronze "celts," or arrow-heads so frequently dug up in Ireland; a pretty fair proof that this animal was killed by the hunter's arrow, and was therefore wild.

No bovine animals of the true taurine race are now known to exist in an aboriginally wild state; but at the

epoch of our earliest historical knowledge of central and western Europe it was far otherwise. Cæsar, describing, under the name of *Urus*, certain wild oxen of the great Hercynian forest, says, "These Uri are little inferior to elephants in size, but are bulls in their nature, colour, and figure. Great is their strength, and great their swiftness, nor do they spare man or beast when once they have caught sight of him. These, when trapped in pit-falls, the hunters unsparingly kill. The youths, exercising themselves by this sort of hunting, are hardened by the toil, and those among them who have killed most, bringing with them the horns, as testimonials, acquire great praise. But these Uri cannot be habituated to man, nor made tractable, not even when taken young. The great size of the horns, as well as the form and quality of them, differs much from those of our oxen."

It is probable that this race extended widely over Europe, and even into Asia. Herodotus mentions Macedonian wild oxen, with exceedingly large (*ὑπερμεγάθια*) horns; and Philip of Macedon killed a wild bull in Mount Orbela, which had made great havoc, and produced much terror among the inhabitants; its spoils he hung up in the Temple of Hercules. The Assyrian artists delighted to sculpture on the royal bas-reliefs of Nineveh the conquest of the wild bull by the prowess of their Nimrod monarchs, and the figures, in their minute anatomical characters, well agree with the descriptions and remains of the European *Urus*. The large forest that surrounded ancient London was infested with *boves sylvestres* among other

wild beasts, and it is probable that these were *Uri*. The legendary exploit of Guy, Earl of Warwick, in freeing the neighbourhood from a terrible dun cow, whether historically true or not, shews the existence of formidable wild bovines in the heart of England, and the terror they inspired among the people. The family of Turnbull, in Scotland, are traditionally said to owe their patronymic to a hero who turned a wild bull from Robert the Bruce, when it had attacked him while hunting.

What has become of the terrible Uri which lived in Europe at the commencement of the Christian era? Advancing civilisation has rooted them out, so that no living trace of them remains, unless the cream-white breed which is preserved in a semi-wild state in some of our northern parks be their representatives; or, as is not improbable, their blood may still circulate in our domestic oxen.

Yet there is no doubt of the identity of a species found abundantly in Britain in the Tertiary deposits, and named by Owen *Bos primigenius*, with the Urus of Cæsar. This fossil bull was as certainly contemporary in this island with the elephant, and the hyena, and the baboon, and, strange to say, with the reindeer, and the musk-ox, too—thus combining a tropical, a temperate, and an arctic fauna in our limited island at the same period! What a strange climate it must have been to suit them all!

Professor Nilsson, who has paid great attention to fossil oxen, mentions a skull of this species which must have belonged to an animal more than twelve feet in length from the nape to the root of the tail, and six feet and

a half in height. Again, the skull of a cow in the British Museum, figured by Professor Owen, measures thirty inches from the crown to the tips of the jaws! What a beast must this have been! Would not the slaughter of such a "Dun Cow" as this in single combat have been an exploit worthy of a doughty earl?

That this ancient fossil bull was really contemporary with man in Scandinavia is proved by evidence which is irrespective of the question of its identity with Cæsar's Urus. For one of Professor Nilsson's specimens "bears on its back a palpable mark of a wound from a javelin. Several celebrated anatomists and physiologists, among whom," he says, "I need only mention the names of John Müller, of Berlin, and Andreas Retzius, of Stockholm, have inspected this skeleton, and are unanimous in the opinion that the hole in question upon the backbone is the consequence of a wound, which, during the life of the animal, was made by the hand of man. The animal must have been very young, probably only a calf, when it was wounded. The huntsman who cast the javelin must have stood before it. It was yet young when it died, probably not more than three or four years old."

We may, then, assume as certain that the vast *Bos primigenius* of Western Europe lived as a wild animal contemporaneously with man; and as almost certain (assuming its identity with the *Urus*) that it continued to be abundant as late as the Christian era.

The *Bos frontosus* is a middling-sized bovine. "Its

remains," says Professor Nilsson, "are found in turf-bogs in Southern Scandinavia, and in such a state as plainly shews that they belonged to a more ancient period than that in which tame cattle existed in Sweden. This species lived in Scandinavia contemporaneously with the *Bos primigenius*, and the *Bison Europæus*. . . . . If ever it was tamed, and thereby in the course of time contributed to form some of the tame races of cattle, it must have been the small-horned, often hornless, breed, which is to be found in the mountains of Norway, and which has a high protuberance between the setting-on of the horns above the nape."

This species occurs in a fossil state in some numbers in Ireland; it has also been found in England. It is by some supposed to be the origin of, or, at least, to have contributed blood to, the middling Highland races with high occiput, and small horns.

There is more certainty of the co-existence of the small *B. longifrons* with man. Some of the evidence I have already adduced. "Within a few years," says a trustworthy authority, "we have read in one of the scientific periodicals,—but have just now sought in vain for the notice,—of a quantity of bones that were dug up in some part of England, together with other remains of what seemed to be the relics of a grand feast, held probably during the Roman domination of Britain, for, if we mistake not, some Roman coins were found associated with them. *There were skulls* and other remains of *Bos longifrons*

quite undistinguishable in form from the antique fossil, whether wild or domesticated, which, of course, remains a question."*

Professor Owen conjectures that this species may have contributed to form the present small shaggy Highland and Welsh cattle,—the kyloes and runts; and a similar breed in the northern parts of Scania may have had a similar origin.

In the *Bison priscus*, the fossil remains of which occur in many parts of Europe, and more sparsely in Great Britain,† we have an example of a noble animal, which, contemporary with all those which have been engaging our attention, survives to the present hour, but is dying out, and would have long ago been extinguished, probably, but for the fostering influence of human conservation. For the species is considered as absolutely identical with the *Bison Europæus* of modern zoology, the Bison or Wisent of the Germans, the Aurochs of the Prussians, the Zubr of the Poles, that formidable creature, which is maintained by the Czar in an ever-diminishing herd in the vast forests of Lithuania,‡ and which, perhaps, still lingers in the fastnesses of the Caucasus. This, the largest, or at least the most massive of all existing quadrupeds, after the great Pachyderms, roamed over Germany in some numbers

* The Editor of "The Indian Field;" in the *Zoologist*," p. 6427.

† The Welsh "Triads," supposed to have been compiled in the seventh century, say that "the Kymri, a Celtic tribe, first inhabited Britain; before them were no men here, but only bears, wolves, beavers, and oxen with high prominences." Were these Bisons?

‡ See Vol. i. 203, *supra*.

as late as the era of Charlemagne. Considerably later than this it is reckoned among the German beasts of chase, for in the *Niebelungen Lied*, a poem of the twelfth century, it is said,

> "Dar nach schlouch er schiere, einen wisent und einen elch,
> Starcher ure viere, und einen grimmen schelch."
>
> "After this he straightway slew a bison and an elk,
> Of the strong uri four, and a single fierce schelch." *

It is a formidable beast, standing six feet high at the shoulders, where it is protected by a thick and profuse mane. Specimens have been known to reach a ton in weight. It manifests an invincible repugnance to the ox.

There are several other animals of note which, like the Bison, were once common inhabitants of these islands, but have long been extinct here, though more genial circumstances have preserved their existence on the continent of Europe. Of the great Cave Bear, no evidence of its period exists, that I know of, except that which may be deduced from the commixture of its remains with those of other animals of whose recent date we have proof. But there is another kind of Bear, whose relics in a fossil state are not uncommon in the Tertiary deposits, viz., the common Black Bear (*Ursus arctos*) of Europe.

This savage animal must have early succumbed to man.

* This is the more interesting because it includes the *Urus* as well as the "*Schelch*," which latter, though the meaning of the word is not certain, some are disposed to identify with the Giant Deer of Ireland.

The "Triads" * mention bears as living here before the Kymri came. The Roman poets knew of their existence here: Martial speaks of the robber Laureolus being exposed on the cross to the fangs of the *Caledonian* Bear; and Claudian alludes to British bears. The Emperor Claudius, on his return to Rome after the conquest of this island, exhibited, as trophies, combats of British bears in the arena. In the Penitential of Archbishop Egbert, said to have been compiled about A.D. 750, bears are mentioned as inhabiting the English forests, but they must have gradually become rare, for the chase-laws of Canute, at the beginning of the eleventh century, are silent about them. In Doomsday Book, we find incidental notice of this animal, for the city of Norwich is said to have been required to furnish a bear annually to Edward the Confessor, together with "six dogs for the bear,"—no doubt for baiting him. This seems to have been the latest trace on record of the bear in Britain; unless the tradition may compete with it, which states that one of the Gordon family was empowered by the king of Scotland to carry three bears' heads on his banner, as a reward for his prowess in slaying a fierce bear.

In Ireland it seems to have become extinct even yet earlier. Bede says the only ravenous animals in his day were the wolf and the fox; Donatus, who died in A.D. 840, distinctly says it was not a native of the island in his time; and Geraldus Cambrensis does not enumerate it as known in the twelfth century. Neither is it included in

* See note † on p. 68.

the ransom-beasts of Cailte's collection. Yet a native Irish name for the bear—Mathghambain—occurs in an old glossary * in the Library of Trinity College, Dublin; and the late Wm. Thomson says that a tradition is current of its having once been an Irish animal; and it is associated with the wolf as a native beast in the stories handed down from generation to generation to the present time.

The wolf, however, survived in both islands to a much later era. In the days of the Heptarchy it was a terrible pest; King Edgar commuted the punishment of certain offences into a requisition for a fixed number of wolves' tongues; and he converted a heavy tax on one of the Welsh princes into an annual tribute of three hundred wolves' heads. These laws continued to the time of Edward I., when the increasing scarcity of the animal doubtless caused them to fall into disuse. Mr Topham, in his Notes to Somerville's "Chase," says, that it was in the wolds of Yorkshire that a price was last set on a wolf's head. The last record of their occurring in formidable numbers in England is in 1281; but for three centuries after this, the mountains and forests of Scotland harboured them; for Hollinshed reports that in 1577 the wolves were very troublesome to the flocks of that country. Nor were they entirely destroyed out of this island till about a century afterwards, when the last wolf fell in Lochaber, by the hand of Sir Ewen Cameron of Lochiel. In Ireland the last wolf was slain in 1710.

* M.S. H. ii. 13.

Thus here we are able to lay our finger on the exact dates when a large and rapacious species of animal actually became extinct so far as the British Isles are concerned. And if the species had been confined in its geographical limits, as many other species of animals are, to one group of islands, we should know the precise date of its absolute extinction.

The Beaver was once an inhabitant of British rivers. Its remains are found in Berkshire, Cambridgeshire, Yorkshire, and elsewhere, associated with the other Mammalia of the fresh-water deposits and caves, but not in any abundance. No record of its actual existence, however, in these counties exists, nor anywhere else but in Wales and Scotland, whose mountain streams and rugged ravines afforded it shelter till after the Norman Conquest. It was very rare even then, and for a hundred years before; for the laws of Howel Dda, the Welsh king, who died in 948, in determining the value of peltry, fix the price of the beaver's skin at a hundred and twenty pence, when the skins of the stag, the wolf, the fox, and the otter, were worth only eightpence each, that of the white weasel or ermine at twelvepence, and that of the marten at twenty-four pence. The appropriate epithet of Broad-tail (Llost-llyddan) was given it by the Welsh. Giraldus Cambrensis, who travelled through Wales in 1188, gives, in his Itinerary, a short account of the beaver, but states that the river Teivy in Cardiganshire, and one other river in Scotland, were the only places in Great Britain, where it was then found. In all probability it did not long survive that

century, for no subsequent notice of it as a British animal is extant. Tradition, however, still preserves the remembrance of its presence in those indelible records, names of places. "Two or three waters in the Principality," says Pennant, "still bear the name of *Llyn yr afangc*,—the Beaver Lake. . . . . I have seen two of their supposed haunts: one in the stream that runs through Nant Francon; the other in the river Conwy, a few miles above Llanrwst; and both places, in all probability, had formerly been crossed by beaver-dams."

If, as naturalists of the highest eminence believe, there is specific difference between the beaver of Europe and that of America, then we may say that our species is fast passing away from the earth. A few colonies yet linger along the banks of the Danube, the Weser, the Rhone and the Euphrates, but they consist of few individuals, ever growing fewer; and the value of their fur exciting cupidity, they cannot probably resist much longer the exterminating violence of man.

The causes which led to the extinction of these animals in our islands are then obvious, and are thus playfully touched by the late James Wilson:—"The beaver might have carried on business well enough, in his own quiet way, although frequently incommoded by the love of peltry on the part of a hat-wearing people; but it is clear that no man with a small family and a few respectable farm servants, could either permit a large and hungry wolf to be continually peeping at midnight through the keyhole of the nursery, or allow a brawny bruin to snuff

too frequently under the kitchen door (after having hugged the watch-dog to death) when the servant-maids were at supper. The extirpation then of at least two of these quondam British species became 'a work of necessity and mercy,' and might have been tolerated even on a Sunday, (between sermons,) especially as naturalists have it still in their power to study the habits of similar wild beasts, by no means yet extinct, in the neighbouring countries of France and Germany." *

Perhaps the example of recent extinction most popularly known is that of the Dodo, a very remarkable bird, which about two centuries ago existed in considerable abundance, in the isles of Mauritius, Bourbon, and Rodriguez. It was a rather large fowl, incapable of rising from the ground, by reason of the imperfect development of its wings, of massive, uncouth figure, predisposed to fatness, and noted for the sapidity of its flesh. Two skulls and two unmatched feet of this strange bird are preserved in European museums; and these shew that its nearest affinities were with the pigeon-tribe, of which we know some species of terrestrial habits, but none approaching this bird in its absolute confinement to the earth.

In the reports of numerous voyagers who visited these islands from the end of the fifteenth century to the middle of the seventeenth, we have many accounts of the appearance and habits of this bird, evidently sketched from the life. Some of the descriptions, as also the figures by which

* *Blackwood's Magazine*, January 1849.

they are illustrated, are quaint enough; as, for example, that graphic sketch hit off by old Sir Thomas Herbert, who saw the bird in his travels in 1634:—

"The Dodo," he says, "comes firſt to our deſcription. Here and in Dygarrois (and nowhere elſe that I c[d] ever ſee or heare of) is generated the Dodo. (A Portuguize name it is, and has reference to her ſimplenes) a bird which for ſhape and rareneſs might be call'd a Phœnix (wer't in Arabia); her body is round and extreame fat, her ſlow pace begets that corpulencie; few of them weigh leſſe than fifty pound: better to the eye than the ſtomack: greaſie appetites may perhaps commend them, but, to the indifferently curious, nouriſhment, but prove offenſive. Let's take her picture: her viſage darts forth melancholy, as ſenſible of nature's injurie in framing ſo great and maſſive a body to be directed by ſuch ſmall and complementall wings, as are unable to hoiſe her from the ground, ſerving only to prove her a bird; which otherwiſe might be doubted of: her head is variouſly dreſt, the one halfe hooded with downy blackiſh feathers; the other perfectly naked; of a whitiſh hue, as if a tranſparent lawne had covered it; her bill is very howked and bends downwards, the thrill or breathing place is in the midſt of it; from which part to the end, the colour is a light greene mixt with a pale yellow; her eyes be round and ſmall, and bright as diamonds; her cloathing is of fineſt downe, ſuch as ye ſee in goſlins; her trayne is (like a China beard) of three or foure

ſhort feythers; her legs thick, and black, and ſtrong; her tallons or pounces ſharp; her ſtomack fiery hot, ſo as ſtones and yron are eaſilie digeſted in it; in that and ſhape, not a little reſembling the Africk oeſtriches: but ſo much, as for their more certain dyfference I dare to give thee (with two others) her repreſentation."*

It is pretty certain that a living specimen was about the same time exhibited in England. Sir Hamon L'Estrange tells us distinctly that he *saw* it. His original MS. is preserved in the British Museum, and with some blanks caused by the injury of time, of no great consequence, reads as follows:—

"About 1638, as I walked London streets, I saw the picture . of a strange fowl hong out upon a cloth. vas and myselfe with one or two more Gen. in company went in to see it. It was kept in a chamber, and was a greate fowle somewhat bigger than the largest Turky Cock and so legged and footed but stouter and thicker and of a more erect shape, coloured before like the breast of a yong Cock Fesan and on the back of dunn or deare coulour. The keeper called it a Dodo and in the ende of a chimney in the chamber there lay an heap of large pebble stones whereof hee gave it many in our sight, some as bigg as nutmegs and the keeper told us shee eats them conducing to digestion and though I remember not how farre the keeper was questioned therein yet I am confident that afterwards shee cast them all agayne." †

* "Travels," 4th ed., 1677. † Sloane MSS., No. 1839.

It is probable that this very specimen passed into the museum of Tradescant, who, in the Catalogue of "The Collection of Rarities preserved at Lambeth," dated 1656, mentions the following: "Dodar from the Island Mauritius: it is not able to flie being so bigg." Willoughby the ornithologist, a most unexceptionable testimony, says that he saw this specimen in Tradescant's museum: it is mentioned also by others;—as by Llhwyd in 1684, and by Hyde in 1700. It passed, with the rest of the Tradescant Collection, to Oxford, and thus became part of the Ashmolean Museum,—and being in a decayed condition, was ordered to be destroyed by the authorities, who had no apprehension of its value, in 1755. The skull and one foot, however, were preserved, and are still in the Museum at Oxford. Remains of the Dodo have been dug up in the Mauritius, and are in the Paris Museum, and in that of the Zoological Society of London. The bird certainly does not exist there now, nor in either of the neighbouring islands.

In the British Museum there is a fine original painting, once the property of George Edwards, the celebrated bird painter, representing the Dodo surrounded by other minor birds and reptiles. Edwards states that "it was drawn in Holland, from a living bird brought from St Maurice's Island, in the East Indies. It was the property of Sir Hans Sloane at the time of his death, and afterwards becoming my property, I deposited it in the British Museum as a great curiosity."

Professor Owen has discovered another original figure

of this interesting form in Savary's painting of "Orpheus and the Beasts," at the Hague. The figure, though small, displays all the characteristic peculiarities, and agrees well with Edwards' painting, while evincing that it was copied from the living bird.

It is possible that there were two species of Dodo; which would explain certain discrepancies in the descriptions of observers. At all events we have here one, if not more, conspicuous animal absolutely extinguished within the last two hundred years.

Just about a century ago a great animal disappeared from the ocean, which, according to Owen, was contemporary with the fossil elephant and rhinoceros of Siberia and England. Steller, a Russian voyager and naturalist, discovered the creature, afterward called *Stelleria* by Cuvier, in Behring's Straits; a huge, unwieldy whale-like animal, one of the marine pachyderms, allied to the Manatee, but much larger, being twenty-five feet long, and twenty in circumference. Its flesh was good for food, and from its inertness and incapacity for defence, the race was extirpated in a few years. Steller first discovered the species in 1741, and the last known specimen was killed in 1768. It is believed to be quite extinct, as it has never been met with since.

Nearly a century ago, Sonnerat found in Madagascar, a curious animal, (*Cheiromys,*) which in structure seems to connect the monkeys with the squirrels. So rare was it there that even the natives viewed it with curiosity as an animal altogether unknown to them; and, from their

exclamations of astonishment rather than from its cry, the French naturalist is said to have conferred upon it the name of Aye-aye, by which it is now known. *Not a specimen, as I believe, has been seen since Sonnerat's day,* so that, if not actually obliterated, the species must be on the verge of extinction.

Species are dying out in our own day. I have already cited the interesting case of the Moho, that fine Gallinule of New Zealand, of which a specimen—probably the last of its race,—was obtained by Mr Walter Mantell; and that of the Káureke, the badger-like quadruped of the same islands, which was formerly domesticated by the Maoris, but which now cannot be found.

The Samoa Isles in the Pacific recently possessed a large and handsome kind of pigeon, of richly-coloured plumage, which the natives called *Manu-mea,* but to which modern naturalists have given the name of *Didunculus strigirostris.* It was, both by structure and habit, essentially a ground pigeon, but not so exclusively but that it fed, and roosted too, according to Lieut. Walpole, among the branches of tall trees. Mr T. Peale, the naturalist of the U. S. Exploring Expedition, who first described it, informs us that according to the tradition of the natives, it once abounded; but some years ago these persons, like more civilised folks, had a strong desire to make pets of cats, and found, by means of whale-ships, opportunities of procuring a supply; but the consequence of the introduction of "pussy,"—for under this familiar old-country title were the exotic tabbies introduced—was the rapid

diminution of the handsome *Manu-mea*. Pussy did not fancy yams and taro—the vegetable diet on which the natives regaled—and took to the woods and mountains to search for something better. There she met with the feeble-winged *Didunculus* scratching the soft earth for seeds, and with a purr and a mew soon scraped acquaintance with the stranger. Pussy declared she loved him well, and so she did—too well, in fact; she felt "as if she could eat him up,"—*and did*. The news soon spread among the tabbies that there were sweet birds in the woods, and the result is the almost total disappearance of poor *Manu-mea*. Like the Dodo, it has ceased to be, but at the hand of a more ignominious foe. The Samoan may truly say to his former pet, "*Cecidisti, O Manu-mea, non manu meâ, sed ungue felino.*" So rare had the bird become, that during the stay of the Expedition only three specimens could be procured, and of these two were lost by shipwreck. I do not know whether another has been met with since. Probably they are all gone; for that was twenty years ago.

When Norfolk Island,—that tiny spot in the Southern Ocean since so stained with human crime and misery—was first discovered, its tall and teeming forests were tenanted by a remarkable Parrot with a very long and slender hooked beak, which lived upon the honey of flowers. It was named *Nestor productus*. When Mr Gould visited Australia in his researches into the ornithology of those antipodeal regions, he found the Nestor Parrot absolutely limited to Philip Island, a tiny satellite of Norfolk Island, whose whole circumference is not more

than five miles in extent. The war of extermination had been so successful in the larger island that, with the exception of a few specimens preserved in cages, not one was believed to survive. Since then its last retreat has been harried, and Mr J. H. Gurney thus writes the dirge of the last of the Nestors:—

"I have seen the man who exterminated the *Nestor productus* from Philip Island, he having shot the last of that species left on the island; he informs me that they rarely made use of their wings, except when closely pressed; their mode of progression was by the upper mandible; and whenever he used to go to the island to shoot, he would invariably find them on the ground, except one, which used to be sentry on one of the lower branches of the *Araucaria excelsa*, and the instant any person landed, they would run to those trees and haul themselves up by the bill, and, as a matter of course, they would there remain till they were shot, or the intruder had left the island. He likewise informed me that there was a large species of hawk that used to commit great havoc amongst them, but what species it was he could not tell me." *

I have before mentioned that Professor Owen had recognised the species in fossil skulls from New Zealand, associated with remains of *Dinornis, Palapteryx, and Notornis.* Thus it appears that the long-billed Parrot is an ancient race, whose extreme decrepitude has just survived to our time;—that it first became extinct from New

* *Zoologist*, p. 4298.

Zealand, then from Norfolk Island, and lastly from Philip Island. Peace to its ashes!

Mr Yarrell, in his "History of British Birds," * commences his account of one of them in these words:—"The Great Auk is a very rare British Bird, and but few instances are recorded of its capture. The natives in the Orkneys informed Mr Bullock, on his tour through these islands several years ago, that only one male had made its appearance for a long time, which had regularly visited Papa Westra for several seasons. The female, which the natives call the queen of the Auks, was killed just before Mr Bullock's arrival. The king or male, Mr Bullock had the pleasure of chasing for several hours in a six-oared boat, but without being able to kill him, for though he frequently got near him, so expert was the bird in its natural element that it appeared impossible to shoot him. The rapidity with which he pursued his course under water was almost incredible. About a fortnight after Mr Bullock had left Papa Westra, this male bird was obtained and sent him, and at the sale of his collection, was purchased for the British Museum, where it is still carefully preserved."

This fine bird, which was larger than a goose, is believed to be extinct. Mr Bullock's specimen was taken in 1812; another was captured at St Kilda in 1822, another was picked up dead near Lundy Island in 1829, and yet another was taken in 1834, off the coast of Waterford.

On the north coast of Europe the bird is equally rare;

* *British Birds*, iii. 477, (Ed. 2.)

not more than two or three, at the utmost, having been procured during the present century. During that period, however, it has haunted one or two breeding-rocks on the south coast of Iceland, in some abundance. In the years 1830 and 1831, as many as twenty-seven were obtained there, and from that time till 1840, about ten more. The last birds obtained on the Iceland coast were a pair, which were shot on their nest in 1844. The last taken in any locality, so far as is known, was one shot in 1848, by a peasant, on the Island of Wardoe, within the Arctic Circle.

Two centuries ago, the Great Auk was not uncommon on the shores of New England; and, off the great fishing-banks of Newfoundland, it appears to have been very abundant. "Its appearance was always hailed by the mariner approaching that desolate coast as the first indication of his having reached soundings on the fishing-banks. During the sixteenth and seventeenth centuries these waters, as well as the Iceland and Faroe coasts, were annually visited by hundreds of ships from England, France, Spain, Holland, and Portugal; and these ships actually were accustomed to provision themselves with the bodies and eggs of these birds, which they found breeding in myriads on the low islands off the coast of Newfoundland. Besides the fresh birds consumed by the ship's crew, many tons were salted down for further use. In the space of an hour, these old voyagers tell us, they could fill thirty boats with the birds. It was only necessary to go on shore, armed with sticks to kill as many

as they chose. The birds were so stupid that they allowed themselves to be taken up, on their own proper element, by boats under sail; and it is even said that on putting out a plank it was possible to drive the Great Auks up and out of the sea into boats. On land the sailors formed low enclosures of stones, into which they drove the Penguins [or Auks], and, as they were unable to fly, kept them there enclosed till they were wanted for the table."

"In 1841, a distinguished Norwegian naturalist, (too early, alas! lost to science,) Peter Stuwitz, visited Tunk Island, or Penguin Island, lying to the east of Newfoundland. Here, on the north-west shore of the island, he found enormous heaps of bones and skeletons of the Great Auk, lying either in exposed masses or slightly covered by the earth. On this side of the island the rocks slope gradually down to the shore; and here were still standing the stone fences and enclosures into which the birds were driven for slaughter." *

It is just possible that the bird may yet haunt the inaccessible coast of East Greenland, but ships sailing between that country and Iceland never meet with it at sea. Nor did Graah observe it during his toilsome researches east of Cape Farewell. The numerous fishing craft that every season crowd the shores of Newfoundland and Labrador forbid the notion that it yet lingers there; for the great market-value set upon the bird and its eggs for collections would prevent its existence there from being overlooked. The numerous Polar voyages of dis-

* Dr Charlton, in the *Trans. Tyneside Nat. Hist. Soc.*

covery, and the annual fleets of whalers, would certainly have discovered it, if it still haunted the more northern regions. It is possible that a few isolated individuals may still survive; but it is the habit of the bird, as of most sea-fowl, to breed in society in bare seaward rocks, and the circumstance that no breeding station is known to be now frequented by the Great Auk renders it but too probable that it also must be classed among the species that were.

The interest attached to this now extinct bird has induced some correspondents of the *Zoologist* to attempt an enumeration of the specimens, both of the bird and of its eggs, (which from their great size, as well as from their rarity, have always had a value with collectors,) known to be preserved in cabinets. The result is that English collections contain 14 birds and 23 eggs; those of continental Europe, 11 birds and 20 eggs; the United States, 1 bird and 2 eggs:—the total being 26 birds and 45 eggs.

It would appear that the rock off the south of Iceland which was the chief breeding resort of the Great Auk, and which from that circumstance bore the name of "Geir-fulga Sker," sank to the level of the sea during a volcanic disturbance in or about the year 1830. "Such disappearance of the fit and favourable breeding-places of the *Alca impennis*," observes Professor Owen, "must form an important element in its decline towards extinction." One might think that there would be rocks enough left for the birds to choose a fresh station; but

really we do not know what are the elements of choice in such a case: some peculiarities exist which make one particular rock to be selected by sea-fowl, when others apparently to us as suitable are quite neglected; but we do not know what they are. Possibly when Geir-fulga Sker sank, there was no other islet fit to supply the blank. Possibly, too, the submersion took place during the breeding season, drowning the eggs or young. If this was the case, it would indeed be "a heavy blow and great discouragement" to the dwindling Alcine nation.

Mr Darwin speaks of a large wolf-like Fox (*Canis antarcticus*) which at the time of his voyage was common to both the Falkland Islands, but absolutely confined to them. He says, "As far as I am aware, there is no other instance in any part of the world, of so small a mass of broken land, distant from a continent, possessing so large an aboriginal quadruped peculiar to itself. Their numbers have rapidly decreased; they are already banished from that half of the island which lies to the eastward of the neck of land between St Salvador Bay and Berkeley Sound. Within a very few years after these islands shall have become regularly settled, in all probability this fox will be classed with the Dodo, as an animal which has perished from the face of the earth." *

The Musk Ox (*Ovibos moschatus*), a long-haired ruminant, resembling what you would suppose a cross between a bull and a sheep might be,—formerly an inhabitant of Britain with the Elephant and the Hyena, but now found

* *Nat. Voy.*, ch. ix.

only on the polar margins of North America,—is becoming very scarce; and it is probable that before long its last representative will leave its bones with those of the lamented Franklin and his companions.

From the more perishable character of vegetable tissues we have far less data for determining the extinction of plant species; but analogy renders it highly probable that these also have died out, and are dying in a corresponding ratio with animals. I am not aware that a single example can be adduced of a plant that has certainly ceased to exist during the historic era. But Humboldt mentions a very remarkable tree in Mexico, of which it is believed only a single specimen remains in a state of nature. It is the Hand-tree (*Cheirostemon platanoides*), a sterculaceous plant with large plane-like leaves, and with the anthers connected together in such a manner as to resemble a hand or claw rising from the beautiful purplish-red blossoms. "There is in all the Mexican free States only one individual remaining, one single primeval stem of this wonderful genus. It is supposed not to be indigenous, but to have been planted by a king of Toluca about five hundred years ago. I found that the spot where the Arbol de las Manitas stands is 8825 feet above the level of the sea. Why is there only one tree of the kind? Whence did the kings of Toluca obtain the young tree, or the seed? It is equally enigmatical that Montezuma should not have possessed one of these trees in his botanical gardens of Huaxtepec, Chapoltepec, and Iztapalapan, which were used as late as by Philip the Second's

physician, Hernandez, and of which gardens traces still remain; and it appears no less striking that the Hand-tree should not have found a place among the drawings of subjects connected with Natural History, which Nezahual Coyotl, king of Tezcuco, caused to be made half a century before the arrival of the Spaniards."

There is an example of this interesting plant growing in one of the conservatories at Kew, but I do not know whence it was obtained. It has been asserted that it grows wild in the forests of Guatemala.

Leaving plants out of consideration from lack of adequate data, we find that a considerable number of species of animals have certainly ceased to exist since man inhabited the globe. There have been, doubtless, many others that have shared the same fate, which we know nothing about. It is only within the last hundred years that we have had anything approaching to an acquaintance with the living fauna of the earth; yet, during that time some seven or eight creatures we know have been extinguished. Fully half of these,—the Auk, the Didunculus, the Notornis, and the Nestor,—within the last ten years! It would really seem as if the more complete and comprehensive an acquaintance with the animals of the world became, the more frequently this strange phenomenon of expiring species was presented to us. Perhaps it is not extravagant to suppose that—including all the invertebrate animals, the countless hosts of insects, and all the recondite forms that dwell in the recesses of the ocean—a species fades from existence every year. All the examples

that have been given were either Mammalia or Birds, (*the Colossochelys* only excepted:) now these, though the most conspicuous and best known, are almost the least populous classes of living beings. There is no reason whatever for concluding that the law of mortality of species does not extend to all the other classes, vertebrate and invertebrate, in an equal ratio, so that my estimate will appear, I think, a very moderate one. Yet it is a startling thought, and one which the mind does not entertain without a measure of revulsion, that the passing of every century in the world's history has left its fauna *minus* a hundred species of animals that were denizens of the earth when it began. I was going to say "left the fauna so much *poorer*;" but that I am not sure of. The term would imply that the blanks are not filled up; and that, I repeat, I am not sure of. Probability would suggest that new forms are continually created to supply the lack of deceased ones; and it may be that *some*, at least, of the creatures ever and anon described as new to science, especially in old and well-searched regions, may be newly called into being, as well as newly discovered. It may be so, I say; I have no evidence that it is so, except the probability of analogy; we know that the rate of mortality among *individuals* of a species, speaking generally, is equalled by the rate of birth, and we may suppose this balance of life to be paralleled when the unit is a species, and not an individual. If the Word of God contained anything either in statement or principle contrary to such a supposition, I would not entertain it for a moment, but

I do not know that it does. I do not know that it is anywhere implied that God created no more after the six days' work was done. His Sabbath-rest having been broken by the incoming of sin, we know from John v. 17, that He continued to work without interruption; and we may fairly conclude that progressive creation was included as a part of that unceasing work.

I know not whether my readers will take the same concern as I do in this subject of the dying-out of species, but to me it possesses a very peculiar interest. Death is a mysterious event, come when and how it will; and surely the departure from existence of a species, of a type of being, that has subsisted in contemporary thousands of individuals, for thousands of years, is not less imposingly mysterious than that of the individual exemplar.

We do not know with any precision what are the immediate causes of death in a species. Is there a definite limit to life imposed at first? or is this limit left, so to speak, to be determined by accidental circumstances? Perhaps both: but if the latter, what are those circumstances?

Professor Owen says:—"There are characters in land animals rendering them more obnoxious to extirpating influences, which may explain why so many of the larger species of particular groups have become extinct, whilst smaller species of equal antiquity have survived. In proportion to its bulk is the difficulty of the contest which the animal has to maintain against the surrounding agencies that are ever tending to dissolve the vital bond, and

subjugate the living matter to the ordinary chemical and physical forces. Any changes, therefore, in such external agencies as a species may have been originally adapted to exist in, will militate against that existence in a degree proportionate to the size which may characterise the species. If a dry season be gradually prolonged, the large mammal will suffer from the drought sooner than the small one; if such alteration of climate affect the quantity of vegetable food, the bulky herbivore will first feel the effects of stinted nourishment; if new enemies be introduced, the large and conspicuous animal will fall a prey while the smaller kinds conceal themselves and escape. Small quadrupeds, moreover, are more prolific than large ones. Those of the bulk of the mastodons, megatheria, glyptodons, and diprotodons, are uniparous. The actual presence, therefore, of small species of animals in countries where larger species of the same natural families formerly existed, is not the consequence of degeneration —of any gradual diminution of the size—of such species, but is the result of circumstances which may be illustrated by the fable of 'the Oak and the Reed;' the smaller and feebler animals have bent and accommodated themselves to changes to which the larger species have succumbed." *

"We do not steadily bear in mind," remarks Mr Darwin, "how profoundly ignorant we are of the condition of existence of every animal; nor do we always remember that some check is constantly preventing the too rapid

* Locture; reported in the *Athenæum* for May 21, 1859.

increase of every organised being left in a state of nature. The supply of food, on an average, remains constant; yet the tendency in every animal to increase by propagation is geometrical; and its surprising effects have nowhere been more astonishingly shewn, than in the case of the European animals run wild during the last few centuries in America. Every animal in a state of nature regularly breeds; yet in a species long established, any *great* increase in numbers is obviously impossible, and must be checked by some means. We are nevertheless seldom able with certainty to tell in any given species, at what period of life, or at what period of the year, or whether only at long intervals, the check falls; or again, what is the precise nature of the check. Hence probably it is, that we feel so little surprise at one, of two species closely allied in habits, being rare and the other abundant in the same district; or again, that one should be abundant in one district, and another, filling the same place in the economy of nature, should be abundant in a neighbouring district, differing very little in its conditions. If asked how this is, one immediately replies that it is determined by some slight difference in climate, food, or the number of enemies: yet how rarely, if ever, we can point out the precise cause and manner of action of the check! We are, therefore, driven to the conclusion that causes generally quite inappreciable by us, determine whether a given species shall be abundant or scanty in numbers.

"In the cases where we can trace the extinction of a species through man, either wholly or in one limited dis-

trict, we know that it becomes rarer and rarer, and is then lost; it would be difficult to point out any just distinction between a species destroyed by man or by the increase of its natural enemies. The evidence of rarity preceding extinction, is more striking in the successive tertiary strata, as remarked by several able observers; it has often been found that a shell very common in a tertiary stratum is now almost rare, and has even long been thought to be extinct. If, then, as appears probable, species first become rare and then extinct—if the too rapid increase of every species, even the most favoured, is steadily checked, as we must admit, though how and when it is hard to say—and if we see, without the smallest surprise, though unable to assign the precise reason, one species abundant, and another closely-allied species rare in the same district—why should we feel such great astonishment at the rarity being carried a step further to extinction? An action going on, on every side of us, and yet barely appreciable, might surely be carried a little further, without exciting our observation. Who could feel any great surprise at hearing that the Megalonyx was formerly rare compared with the Megatherium, or that one of the fossil Monkeys was few in number compared with one of the now living Monkeys? and yet, in this comparative rarity, we should have the plainest evidence of less favourable conditions for their existence. To admit that species generally become rare before they become extinct—to feel no surprise at the comparative rarity of one species with another, and yet to call in some extraordinary agent and to marvel greatly

when a species ceases to exist, appears to me much the same as to admit that sickness in the individual is the prelude of death—to feel no surprise at sickness—but when the sick man dies to wonder, and to believe that he died through violence."*

Geographical distribution is an important element in this question of extinction. A species that is spread over a wide region is far more likely to survive than one which is confined to a limited district; and extraneous influences acting prejudicially will exterminate a species which is confined to an island much sooner than if it had a continent to retire upon. We have seen how the *Nestor* Parrot became extinct in New Zealand, while it survived in Norfolk Island, because the former was colonised by the Maori race, while the latter remained in its virginity. But how quickly did the poor Parrot succumb as soon as man set his foot on Norfolk and Philip Islands! And how brief was the lease of life accorded to the *Didunculus*, when once the "Pussies" found their way to the little Samoa isles!

Very many islands have a fauna that is to a great extent peculiar to themselves. I know that, in Jamaica, the Humming-birds, some of the Parrots, some of the Cuckoos, most of the Pigeons, many of the smaller birds, and, I think, all of the Reptiles, are found nowhere else. Nay, more, that even the smaller islands of the Antilles have each a fauna of its own, unshared with any other land;—its own Humming-birds, its own Lizards and

* *Nat. Voyage*, ch. viii.

Snakes; its own Butterflies and Beetles, its own Spiders, its own Snails, its own Worms. How likely are some of these very limited species to become extinguished! By the increasing aggressions of clearing and cultivating man; by slight changes of level; even by electric and meteoric phenomena acting very locally. I find that, in Jamaica, many of the animals peculiar to the island are not spread over the whole surface, limited as that is, but are confined to a single small district. In some cases, the individuals are but few, even in that favoured locality; how easily we may conceive of a season drier than ordinary, or wetter than ordinary, or a flood, or a hurricane of unusual violence, or a volcanic eruption, either killing outright these few individuals, or destroying their means of living, and so indirectly destroying them by starvation. And then the species has disappeared!

The common Red Grouse, so abundantly seen during the season hanging at every poulterer's and game-dealer's shop in London, is absolutely unknown out of the British Isles. It could not live except in wide, unenclosed, uncultivated districts; so that when the period arrives that the whole of British land is enclosed and brought under cultivation, the Grouse's lease of life will expire. We owe it to our hard-worked members of Parliament to hope that this condition of things may be distant.

II.

THE MARVELLOUS.

THE vulgar mind is very prone to love the marvellous, and to count for a prodigy every unusual phenomenon, every occurrence not perfectly accountable on any hypothesis which is familiar to them. The poetical period of history in every country is full of prodigies; for in the dawn of civilisation the physical laws of nature are little understood, and multitudes of natural phenomena are either referred to false causes, or, being unreferrible to any recognised cause, are set down as mere wonders. It is the province of science to dispel these delusions, to expose the undiscovered, but by no means undiscoverable, origins of unusual events, and thus to be continually narrowing the limits of the unknown. These limits, however, have not even yet quite reached the minuteness of a mathematical point; and there are a few marvels left for the indefatigable rummagings of modern science to explain.

Perhaps the predominant tendency of uneducated minds in the present day is rather to attribute effects to *false* causes, than to leave them without any assignable cause. It is much easier for an unreasoning person to say that Tenterden steeple is the cause of Goodwin Sands, than to leave Goodwin Sands quite unaccounted for; or, to say,

the plant-lice suddenly appear crowding the rose-twigs, "the east wind has cast a blight," or "it is something in the air," than "I do not know how to account for their appearance." To a reflecting person, indeed, who weighs forces, the east wind appears as incompetent to the production of living animals as the tall tower to the origination of a sand-bank; and this, though he might be able to suggest nothing a whit more competent. What should he do in such a case? Manifestly this—test the actual existence and conditions of the phenomenon; see that it really has occurred; and, if the fact cannot be denied, admit it as a fact, and wait further light as to its causation.

I do not by any means presume to declare the universal "why and because" of every familiar or unfamiliar occurrence: I leave that to more pretentious philosophers; smiling occasionally in my sleeve at the egotism which cannot see its own *non-sequiturs*. But still less can I consent to set aside every phenomenon which I cannot explain, with the common resource,—"Pooh! pooh! there must be some mistake!" Rather would I say, "There must still be some ignorance in me: near as I have reached to the summit of the ladder of knowledge, there must be still one or two rongs to be mounted before I can proclaim my mastery of all, absolutely *all*, the occult causes of things. Therefore, till then I must be content with the lowlier task of patiently accumulating evidence."

At various times and in various places popular super-

stition has been excited by the occurrence of what have been called showers of blood. The destruction of cities and of kingdoms has been, according to historians, preceded by this awful omen. Yet this has been explained by a very natural and accountable phenomenon. In the year 1553, the hedges and trees, the stones of the pathway, and the clothes of many persons, were sprinkled copiously with drops of red fluid, which was supposed to be blood, till some observant person noticed the coincident appearance of unusual swarms of butterflies, and marked that the coloured drops proceeded from them. Again, at Aix la Chapelle in 1608, the same awful appearance occurred, especially on the walls of a particular churchyard. M. Peiresc, an able naturalist, residing at Aix, traced the phenomenon here to the same cause. Just before, he had found a large chrysalis, which he had enclosed in a box, in order to identify the species to which it belonged. A few days after, hearing a rustling, he opened the box, and discovered a beautiful butterfly evolved from the pupa, which had left upon the floor of its prison a large red stain. He saw that the character of this deposit agreed exactly with that of the ominous drops abroad, and remarking an unusual abundance of the same kind of butterfly, he conceived that he had revealed the cause of the terrific phenomenon. He was confirmed in this belief by the circumstance that the supposed blood-drops were not found in the streets of the town, nor upon the roofs of the houses, where they must have occurred had they fallen from the sky; and, moreover, that it was rare to see

any on the exposed parts of stones, walls, &c.; but rather under the protection of angles, and in slight cavities—which agrees well with the habits of the insects in question. No doubt this was the true explanation of the phenomenon, but it does not say much for the powers of observation which could have attributed it to blood, for the colour is by no means that of blood, especially *dried* blood, but much more crimson; and the earthy deposit, resembling chalk, which copiously remains after the fluid part has evaporated, would in a moment convince any one who was in the habit of comparing things which differ, that, whatever the substance was, blood it certainly was not.

I myself not long ago met with an appearance which bore a much closer resemblance to drops of blood than this, and which yet was referrible to a widely different origin. In the neighbourhood of Ashburton, in Devon, a quarter of a mile or so from the town, there is a shallow horse-pond, the bottom of which consists of an impalpable whitish mud, much indented with hoof-holes and other irregularities. In these, the water being dimly clear from settlement, I observed what looked exactly like blood, in numerous patches, the appearance being as if two or three drops of blood had fallen in one spot, half-a-dozen in another, and so on. The colour was true, and even when I alighted, and looked carefully on the spots, they had just that curdled appearance that drops of blood assume when they fall into still water. But there appeared on minute examination a constant intestine motion in each spot, which caused me to bring my eye closer, when I

discovered that I had been egregiously deceived. Each apparent drop of blood was formed of a number of slender worms, about as thick as a hog's bristle, and an inch and a half long, of a red hue, which protruded the greater part of their length from the mud, in a radiating form, each maintaining a constant undulatory movement. There were more or fewer centres of radiation, the circles frequently interrupted by, and merging into, others, just as drops of blood crowded together would do. On the slightest disturbance the little actors shrank out of sight into the soft mud; but by scooping up a little of this I contrived to get a number of them into a phial, which, as the sediment settled, were seen at the bottom playing as if in their pond. On examination of the specimens with a microscope I found them to be minute Annelids, such as I have described, apparently of the genus *Lumbriculus* of Grube, with two rows of bristle-pencils, and two bristles in a pencil. The body was transparent and colourless, and the red hue was given by the great and conspicuous longitudinal blood-vessels, and by the lateral connecting vessels, which viewed sidewise took the form of loops. The animals soon died in captivity, but I kept some for three or four days alive.

I have elsewhere referred to the curious phenomenon of crimson snow, and to the uncertainty which still hangs over its cause. I have lately met with another explanation, which seems sufficiently guaranteed to be depended on, though, as the red snow occurs in places where this cause cannot operate, it only shews that similar results

may be produced by diverse agencies. A certain resemblance between the facts and those adduced by M. Peiresc will warrant my quoting them. Mr Thomas Nicholson, in a visit to Sowallik Point, in Prince Regent's Inlet, thus describes what he saw:—"The summit of the hill forming the point is covered with huge masses of granite, while the side, which forms a gentle declivity towards the bay, was covered with crimson snow. It was evident, at first view, that this colour was imparted to the snow by a substance lying on the surface. This substance lay scattered here and there in small masses bearing some resemblance to powdered cochineal, surrounded by a lighter shade, which was produced by the colouring matter being partly dissolved and diffused by the deliquescent snow. During this examination our hats and upper garments were observed to be daubed with a substance of a similar red colour; and a moment's reflection convinced us that this was the excrement of the little Auk, myriads of which bird were continually flying over our heads, having their nests among the loose masses of granite. A ready explanation of the origin of the red snow was now presented to us, and not a doubt remained in the mind of any of us that this was the correct one. The snow on the mountains of higher elevation than the nests of these birds was perfectly white; and a ravine at a short distance, which was filled with snow from top to bottom, but which afforded no hiding-place for these birds to form their nests, presented an appearance uniformly white."*

* *Mag. Nat. Hist.*, ii. 322.

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After all, however, real *bonâ fide* rain does sometimes descend, which, if not blood-red, is at least red. "M. Giovanni Campani, Professor of Chemistry at the University of Siena, has just published a letter, addressed to Professor Matteucci, on a most singular phenomenon which occurred at Siena in December last. On the 28th of that month, about seven A.M., the inhabitants of the north-western part of the city witnessed with surprise the curious phenomenon of a copious fall of rain of a reddish hue, which lasted two hours; a second shower of the same colour occurred at eleven A.M., and a third at two P.M., but that of the deepest red fell the first time. But what adds to the strangeness of the occurrence is that it was entirely confined to that particular quarter of the town, and so nicely was the line drawn that the cessation of the red colour was ascertained in one direction to be at about two hundred mètres from the meteorological observatory, the pluviometer of which received colourless rain at exactly the same time. The temperature during the same interval varied between 8 deg. and 10 deg.. Centigrade (46 and 50 Fahrenheit). The wind blew from the S.W. at the beginning of the phenomenon, and afterwards changed to W.S.W. None of the rural population in the immediate vicinity of Siena remarked the occurrence, so that most probably the rain that fell round the town was colourless. The same phenomenon, strange to say, recurred in exactly the same quarter of the town on the 31st of December. and again on the 1st of January, the wind being W.N.W., and the temperature respectively 35 and 39·42 deg.,

Fahrenheit. Each time, however, the red colour diminished in depth, its greatest strength having at no time exceeded that of weak wine and water. A similar occurrence is recorded as having taken place in 1819 at Blankenburg, when MM. Meyer and Stopp found the water to contain a solution of chloride of cobalt. Professor Campani, who is now engaged, in conjunction with his colleague, Professor Gabrielli, in analyzing the red water collected, has ascertained that in this instance it contains no chloride of cobalt, and, moreover, that the colour must be owing to some solution, since the water has deposited no sediment."*

The occasional occurrence of large masses of water stained of a vivid red hue, and for the most part suddenly, and without any ostensible cause, has not unreasonably been recorded as a prodigy, rivalling one of the plagues of Egypt—the turning of the waters into blood.

"I remember," says Mr Latrobe, "the report reaching Neufchatel, through the medium of the market-people passing from the one lake to the other, (some time during the winter,) that the waters of the lake of Morat had suddenly become the colour of blood, though I could meet with no one whose testimony was sufficiently clear and unequivocal to establish the fact. This, joined to my not having the leisure then to go and see for myself, caused the matter to slip from my memory entirely, till I found myself in the neighbourhood. Here the cir-

* From the *Times* of Jan. 24, 1861.

cumstance was fully confirmed to me in a manner not to be questioned; and having since met with a paper, written by M. de Candolle, of Geneva, on the subject, I shall take what is there stated as my best guide in mentioning the facts as they occurred:—

"It appears that this singular phenomenon began to excite the attention of the inhabitants of Morat as early as November last year, and that it continued more or less observable during the whole of the winter.

"Mr Trechsel, a gentleman resident at Morat, to whom M. de Candolle applied, on hearing the report, for information and specimens of the colouring matter, stated—That during the early hours of the day no extraordinary appearance was observable in the lake; but that a little later, long parallel lines of reddish matter were seen to extend along the surface of the water, at some short distance from the banks. This, being blown by the wind towards the more sheltered parts of the shore, collected itself about the reeds and rushes, covering the surface of the lake with a light foam; forming as it were different strata of various colours, from greenish black, grey, yellow, and brown, to the most delicious red. He adds, that this matter exhaled a pestiferous odour during the day, but disappeared at the approach of night. It was further observed, that during tempestuous weather it vanished altogether. Many small fishes were seen to become intoxicated while swimming amongst it, and after a few convulsive leaps, to lie motionless on the surface.

"The naturalists of Geneva decided, from the specimens

sent, that it was an animal substance, which, if not the *Oscillatoria subfusca*,* was nearly allied to it.

"Soon after the beginning of May it disappeared entirely. It is not known that this phenomenon has appeared before in the lake of Morat within the memory of man. Tradition states the same to have happened the year preceding the great battle." †

A few years ago, in one of my tanks of sea-water, there occurred a phenomenon much like this. Patches of a rich crimson-purple colour formed here and there on the surface, which rapidly grew on all sides till they coalesced. If allowed to be a few days undisturbed, the entire surface of the water became covered with a pellicle of the substance, which spread also over the stones and shells of the bottom, and the sides of the vessel. It could be lifted in impalpable laminæ on sheets of paper. I found it difficult to keep it within bounds, and impossible to get quite rid of it, till, after some months, I lost it by the accidental breaking of the vessel. Under the microscope, this proved an *Oscillatoria*, which I could not identify with any of the described species in Harvey's *Phytologia:* the filaments creeping and twining with the peculiar vermicular movements of the genus.

Blood-like waters are sometimes produced by a rapid evolution of infusorial animalcules. Of these the most effective are *Astasia hæmatodes*, and *Euglena sanguinea;*

* The *Oscillatoria* is a genus of *plants;* it is a microscopic *Alga* of wire-like form belonging to the great Confervoid family, having the remarkable peculiarity of spontaneous and apparently voluntary motion.

† Latrobe's *Alpenstock*, p. 12.

both of them minute spindle-shaped creatures of a pulpy substance, and sanguine hue. They are produced occasionally in incalculable numbers, increasing with vast rapidity by means of spontaneous division. Ehrenberg suggests that the miracle of blood-change performed on the Nile and on all other collections of water in Egypt by Moses (Exod. vii. 17–25) may have been effected by the agency of these animalcules. Of course it would require Divine power as much to educe uncounted millions of animalcules at the word of command, as to form real blood, so that no escape from the presence of Deity would be gained by admitting the supposition; but the words of the inspired narrative seem to render it untenable.

To return to showers. "If it should rain cats and dogs,"—is a phrase which is in many mouths; but probably no one has heard it transferred from the subjunctive to the indicative mood. Why not, however, if it rains snails, frogs, fishes, and feathers? That these animals and animal products are really poured down from the atmosphere, I can adduce some evidence; the value of which my readers may weigh when they have heard the pleadings.

In that venerable newspaper, *Felix Farley's Journal*, for July 1821, there was "an account of a wonderful quantity of snail-shells found in a piece of land of several acres near Bristol, that common report says fell in a shower." This shell-storm attracting much attention at the time, Mr Wm. Baker, of Bridgewater, asked information from the Curator of the Bristol Institution, who thus

cleared up the mystery:—"The periwinkles are indeed wonderful. They descended, forsooth, in a heavy rain-like shower on the field of Mr Peach, as a due punishment for his disrespect to the virtues of our late queen. The shower was so intense, that the umbrella of an old lady passing by was broken to pieces, and the fragments lifted in the air by the whirlwind, which picked up all the periwinkles on the neighbouring hills, and dropped them three inches thick on Mr Peach's field! But you know the story of 'The Three Black Crows;' and thus the whole is reduced to no periwinkle rain, no whirlwind; but turns out to be our old friend *Helix virgata*, making its annual pilgrimage in search of a mate, and occurring one in almost every square inch in the field in question."

Provincial newspapers seem to have a special power of reporting such natural history facts, which rarely survive investigation. The *Stroud Free Press*, for May 23, 1851, tells us that "an extraordinary scene was witnessed at Bradford, about twelve miles from Bristol, on Saturday week, when that village was visited by a heavy shower of snails. They might have been gathered by bushels." Mr J. W. Douglas, the eminent entomologist, immediately asked some pertinent questions anent the shower; but whether it was that the witnesses were grieved at his profanely comparing such prodigies to Professors Morison and Holloway's cures, or whether they had no more definite intelligence to communicate, *certes* echo answered not.

We fear we must give up snails. But frogs! everybody knows that toads and frogs fall from the sky. According

to travellers in tropical America, the inhabitants of Portobello assert that every drop of rain is changed into a toad; the more instructed, however, believe that the spawn of these animals is raised with the vapour from the adjoining swamps, and being driven in the clouds over the city, the ova are hatched as they descend in rain. 'Tis certain that the streets after a night of heavy rain are almost covered with the ill-favoured reptiles, and it is impossible to walk without crushing them.* But heretic philosophers point to the mature growth of the vermin, many of them being six inches in length, and maintain that the clever hypothesis just mentioned will scarcely account for the appearance of these.

In the *Leeds Mercury* for June 1844, there occurred the following statement:—"In the course of the afternoon of Monday last, during the prevalence of rather heavy rain, the good people of Selby were astonished at a remarkable phenomenon. It was rendered forcibly apparent, that, with the descent of the rain, there was a shower of another description, viz. a shower of frogs. The truth of this was rendered more manifest by the circumstance that several of the frogs were caught in their descent by holding out hats for that purpose. They were about the size of a horse-bean, and remarkably lively after their aerial but wingless flight. The same phenomenon was observed in the immediate neighbourhood."

The editor of the *Zoologist* immediately asked for confirmation of the stated facts, from resident persons of

* Seemann's *Isthmus of Panama*.

science; but notwithstanding the circumstantiality of the account, and especially the reported actual capture of the little sprawlers in hats, no one replied to the demand, and we are compelled to conclude that the report would not bear critical investigation.

Yet incredulity may be pushed too far even here. For, in the continental journals many more such statements occur than in those of this country, and some of them vouched by apparently indisputable authority. If my readers will refer to *L'Institut.* tom. ii. (1834) pp. 337, 346, 347, 353, 354, 386, 409; tom. iv. (1836) pp. 221, 314, 325; tom. vi. (1838) p. 212, they will find mention made of this phenomenon,—showers of toads. In two or three of these cases, the toads were not only observed in countless numbers on the ground, during, and after, heavy storms of rain, but were seen to strike upon the roofs of houses, bounding thence into the streets; they even fell upon the hats, umbrellas, and clothes of the observers, who were out in the storm, and, in one instance, were actually received into the outstretched hand.*

Much more recently, namely, early in 1859, the newspapers of South Wales recorded a shower of fish in the Valley of Aberdare. The repeated statements attracted more notice than usual, and the Rev. John Griffith, the vicar of the parish, communicated the following results of his inquiries to the *Evening Mail*:—

"Many of your readers might, perhaps, like to see the

* I am indebted for this note to the Rev. Leonard Jenyns. See his edition of White's *Selborne*, (1843) p. 66.

facts connected with this phenomenon. They will be better understood in the words of the principal witness, as taken down by me on the spot where it happened. This man's name is John Lewis, a sawyer in Messrs Nixon and Co.'s yard. His evidence is as follows :—'On Wednesday, February 9, I was getting out a piece of timber for the purpose of setting it for the saw, when I was startled by something falling all over me—down my neck, on my head, and on my back. On putting my hand down my neck I was surprised to find they were little fish. By this time I saw the whole ground covered with them. I took off my hat, the brim of which was full of them. They were jumping all about. They covered the ground in a long strip of about eighty yards by twelve, as we measured afterwards. That shed (pointing to a very large workshop) was covered with them, and the shoots were quite full of them. My mates and I might have gathered bucketfuls of them, scraping with our hands. We did gather a great many, about a bucketful, and threw them into the rain-pool, where some of them now are. There were two showers, with an interval of about ten minutes, and each shower lasted about two minutes or thereabouts. The time was eleven A.M. The morning up-train to Aberdare was just then passing. It was not blowing very hard, but uncommon wet, just about the same wind as there is to-day (blowing rather stiff), and it came from this quarter (pointing to the S. of W.). They came down with the rain in "a body, like."' Such is the evidence. I have taken it for the purpose of being laid before Pro-

fessor Owen, to whom, also, I shall send to-morrow, at the request of a friend of his, eighteen or twenty of the little fish. Three of them are large and very stout, measuring about four inches. The rest are small. There were some —but they are since dead—fully five inches long. They are very lively.—Your obedient servant,

"JOHN GRIFFITH,

"Vicar of Aberdare and Rural Dean.

"VICARAGE, ABERDARE, *March* 8."

The specimens which were forwarded to Professor Owen were exhibited in a tank at the Zoological Gardens in the Regent's Park: they consisted of minnows (*Leuciscus phoxinus*) and Smooth-tailed sticklebacks (*Gasterosteus leiurus.*) A *savant* thus endeavoured to "enlighten" the uninitiated on the matter:—"On reading the evidence it appears to me most probably only a practical joke of the mates of John Lewis, who seem to have thrown a pailful of water with the fish in it over him, and he appears to have returned them to the pool from which they were originally taken. The fish forwarded are very unlike those taken up in whirlwinds in tropical countries, and we must make allowance for unintentional exaggerations of quantity, &c., in an account given a month after the event had occurred."

This "appears to me" a beautiful example of critical acumen. My readers will do well to look at it for a moment; as they may thus learn how to sift the grain of truth out of the bushel of chaff. *Reverentèr procedamus!*

The main (is it not the only?) objection to the honest sawyer's statement is that "the fish are very unlike those taken up in whirlwinds in tropical countries." That is, that, seeing the phenomenon occurs in Great Britain, it is most unfortunate that the fishes are British species. Now, in India, when such things occur, it is always *Indian* species that are taken up; *ergo*, it ought to be Indian species *here*. But these are "very unlike" the Indian fishes; *ergo*, it is manifestly a humbug.

Then, does it not strike one as palpably probable, when once one's dull intellect has been "enlightened" by the brilliant suggestion,—that the worthy sawyer who had a pail of water soused upon him, thought it was a heavy shower of rain? *Very* heavy, no doubt; indeed he says it was "uncommon wet." To be sure, he thought there were *two* showers, each lasting about two minutes, with an interval of ten minutes between them; but this little error might be easily made, for doubtless a bucket of water poured on one's head might well be equivalent to two showers of rain, or even ten, for that matter. To be sure, moreover, there was a considerable quantity of fish:—"The whole ground was covered with them: they were jumping all about: they covered the ground in a long strip of about eighty yards by twelve, *as we measured* afterwards: the shed was covered with them, and the shoots were quite full of them. . . . . My mates and I might have gathered bucketfuls of them: we did gather about a bucketful." Yes, yes: but all were originally in the pail of water thrown over you, John. How stupid

you were, not to perceive *that!* How there was room for any water at all in the pail, seeing there were so many fish, you say you don't know; but that is your stupidity, John! There *must* have been room for water, for it was "uncommon wet;" and the water was in the pail, for the Doctor says so. Uncommon fishy, too, I should think; but let that pass. Where the mates collected the pail of live fishes for their pleasant and profitable hoax, and how, and when,—the sceptic might wonderingly ask; but a hoax it was. *Ipse dixit.*

However, the verdict did not obtain universal assent; and an excellent and well-known naturalist, Mr Robert Drave, residing in the vicinity, ventured modestly to indicate a dissent. "I think actual fact will excuse the otherwise apparently unbecoming assumption in me, of opposing such high authority by a contrary opinion, for from information *obtained from many sources, and very careful and minute* inquiry, I am quite convinced that a great number of fish did actually descend with rain *over a considerable tract of country.* The specimens I obtained *from three individuals,* resident some distance from each other, were of two species, the common minnow and the three-spined stickleback; the former most abundant, and mostly very small, though some had attained their full size."*

If now we look to other lands, we shall find that the descent of fishes from the atmosphere, under conditions little understood, is a phenomenon which rests on indubi-

* *Zoologist,* pp. 6541, 6564.

table evidence. Humboldt has published interesting details of the ejection of fish in large quantities from volcanoes in South America. On the night between the 19th and 20th of June, 1698, the summit of Carguairazo, a volcano more than 19,000 feet in height, fell in, and all the surrounding country for nearly thirty-two square miles was covered with mud and fishes. A similar eruption of fish from the volcano of Imbaburu was supposed to have been the cause of a putrid fever which raged in the town of Ibarra seven years before that period.

These facts are not inexplicable. Subterraneous lakes, communicating with surface-waters, form in deep cavities in the declivities, or at the base of a volcano. In certain active stages of ignition, these internal cavities are burst open, and their contents discharged through the crater. Humboldt ascertained that the fishes in question belonged to a curious and ill-favoured species of the *Siluridæ*,—the *Pimelodes Cyclopum*.

Showers of fishes, however, do occur, which cannot be connected with volcanic agency. Dr Buist, in an interesting paper published in the *Bombay Times* in 1856, has collected a number of authentic examples of this phenomenon. The author, after enumerating the cases just cited, and others of similar character, in which fishes were said to have been thrown out from volcanoes in South America, and precipitated from clouds in various parts of the world, adduces the following instances of similar occurrences in India:—"In 1824," he says, "fishes fell at Meerut, on the men of her Majesty's 14th Regi-

ment, then out at drill, and were caught in numbers. In July 1826, live fish were seen to fall on the grass at Moradabad during a storm. They were the common *Cyprinus*, so prevalent in our Indian waters. On the 19th of February 1830, at noon, a heavy fall of fish occurred at the Nokulhatty factory, in the Daccah Zillah; depositions on the subject were obtained from nine different parties. The fish were all dead; most of them were large; some were fresh, others were rotten and mutilated. They were seen at first in the sky, like a flock of birds, descending rapidly to the ground; there was rain drizzling, but no storm. On the 16th and 17th of May, 1833, a fall of fish occurred in the Zillah of Futtehpoor, about three miles north of the Jumna, after a violent storm of wind and rain. The fish were from a pound and a-half to three pounds in weight, and of the same species as those found in the tanks in the neighbourhood. They were all dead and dry. A fall of fish occurred at Allahabad, during a storm in May 1835; they were of the chowla species, and were found dead and dry after the storm had passed over the district. On the 20th of September 1839 after a smart shower of rain, a quantity of live fish, about three inches in length, and all of the same kind, fell at the Sunderbunds, about twenty miles south of Calcutta. On this occasion it was remarked that the fish did not fall here and there irregularly over the ground, but in a continuous straight line, not more than a span in breadth. The vast multitudes of fish, with which the low grounds round Bombay are covered, about a week or

ten days after the first burst of the monsoon, appear to be derived from the adjoining pools or rivulets, and not to descend from the sky. They are not, as far as I know, found in the higher parts of the island. I have never seen them, though I have watched carefully, in casks collecting water from the roofs of buildings, or heard of them on the decks or awnings of vessels in the harbour, where they must have appeared had they descended from the sky. One of the most remarkable phenomena of this kind occurred during a tremendous deluge of rain at Kattywar, on the 25th of July 1850, when the ground around Rajkote was found literally covered with fish; some of them were found on the top of haystacks, where probably they had been drifted by the storm. In the course of twenty-four successive hours twenty-seven inches of rain fell, thirty-five fell in twenty-six hours, seven inches in one hour and a-half, being the heaviest fall on record. At Poonah, on the 3d of August 1852, after a very heavy fall of rain, multitudes of fish were caught on the ground in the cantonments, full half a mile from the nearest stream. If showers of fish are to be explained on the assumption that they are carried up by squalls or violent winds, from rivers or spaces of water not far away from where they fall, it would be nothing wonderful were they seen to descend from the air during the furious squalls which occasionally occur in June."

Sir E. Tennent adds the following examples:—"I had an opportunity, on one occasion only, of witnessing the phenomenon which gives rise to this popular belief. I

was driving in the cinnamon gardens near the fort of Colombo, and saw a violent but partial shower descend at no great distance before me. On coming to the spot, I found a multitude of small silvery fish from one and a half to two inches in length, leaping on the gravel of the high road, numbers of which I collected and brought away in my palankin. The spot was about half a mile from the sea, and entirely unconnected with any watercourse or pool.

"Mr Whiting, who was many years resident at Trincomalee, writes me that he 'had been often told by the natives on that side of the island that it sometimes rained fishes; and on one occasion (he adds) I was taken by them, in 1849, to a field at the village of Karrancotta-tivo, near Batticaloa, which was dry when I passed over it in the morning, but had been covered in two hours by sudden rain to the depth of three inches, in which there was then a quantity of small fish. The water had no connexion with any pond or stream whatsoever.' Mr Cripps, in like manner, in speaking of Galle, says: 'I have seen in the vicinity of the fort, fish taken from rain-water that had accumulated in the hollow parts of the land that in the hot season are perfectly dry and parched. The place is accessible to no running stream or tank; and either the fish, or the spawn from which they were produced, must of necessity have fallen with the rain.'" *

Mr J. Prinsep, the eminent secretary to the Asiatic Society of Bengal, found a fish in the pluviometer at Calcutta, in 1838.†

* *Ceylon*, i. 211.

† *Journ. Asiat. Soc. Bengal*, vi. 465.

It is a highly curious fact that the pools, reservoirs, and tanks in India and Ceylon are well provided with fish of various species, though the water twice every year becomes perfectly evaporated, and the mud of the bottom becomes converted into dust, or takes the condition of baked clay, gaping with wide and deep clefts, in which not the slightest sign of moisture can be detected. This is the case with temporary hollows in the soil, which have no connexion with running streams or permanent waters, from which they might be supposed to receive a fresh stock of fish.

Two modes of accounting for this strange phenomenon have obtained currency. The one is that received by those Europeans who are content with any solution of a difficulty, without too closely testing it; viz., that the fishes fall with the rains from the air. The actual occurrence of such showers rests, as we have just seen, on good evidence; but, admitting the fact, it must be a rare phenomenon, whereas the presence of fish in the new-made pools is universal. Again, if the rains brought them in such abundance as to stock all the pools, an equal number would fall on the dry ground, which is not pretended to be the case. The other accepted solution is that which has received the sanction of Mr Yarrell, who observes—"The impregnated ova of the fish of one rainy season are left unhatched in the mud through the dry season, and from their low state of organisation *as ova*, the vitality is preserved till the occurrence and contact of the rain and

the oxygen of the next wet season, when vivification takes place from their joint influence." *

This may be fully allowed, yet it does not meet the exigences of the case. Sir E. Tennent and others have shewn that it is not young fishes just escaped from the egg which appear in the new-formed pools, but full-grown fishes, fit for the market; a fact well known to the Singalese fishermen, who resort to the hollows as soon as the monsoon has brought rain; and they invariably take in these pools, which a day or two before were as dry as dust, plenty of fishes fully grown, a foot or eighteen inches long, or longer.

Neither of these hypotheses, then, will account for the fact: and we must admit that the fishes of these regions have the instinct to burrow down in the solid mud of the bottom, at the approach of the dry season, and the power of retaining life, doubtless in a torpid condition, until the return of the periodic rains, as Theophrastus long ago observed.†

The *Lepidosiren*, a very remarkable genus of animals from Africa and South America, affords a curious illustration of this power. It is altogether a highly singular creature, and has attracted a great deal of notice because its organisation belongs to two types: it is, so to speak, placed midway between the great classes of Reptiles and Fishes, the characters which identify it with either being

* *Brit. Fishes*, i. xxvii. Aristotle had long before given the same explanation.

† *De Pisc. in sicco degent.*

almost equally balanced. Professor Owen and other eminent physiologists regard it as a fish, while Professor Bischoff, with others equally learned, consider it an Amphibian reptile.

It is the habits of this strange creature, however, which induce me to notice it here. An inhabitant of rivers and ponds, which are swollen by periodic rains, and subject to entire or partial desiccation by long droughts, it is liable to be left by the retreating waters, exposed to the burning sun, under which it would presently die, but for a special provision.

The animal has the instinct to bury itself in the mud of the bottom, on the approach of the droughts, penetrating to a depth of several feet. There it coils itself into a ball, with the tail folded over the nose, but so as to leave the nasal apertures uncovered; and, probably by its wrigglings, it forms a cavity or chamber in the clay, which becomes lined with a membranous slough thrown off from its body. Meanwhile the water evaporates, the mud dries, bakes, and cracks under the torrid heat of the dry season, thus allowing air to penetrate down to the retreat of the torpid mud-fish, in sufficient quantity for its very sluggish respiration. Here it lies inactive for five or six months, until the wet season again sets in, and the returning floods cover the old beds, soften the baked clay, revivify the imprisoned animal, and restore it to liberty and aquatic locomotion.

To meet these strange conditions of life, the *Lepidosiren* is furnished with a twofold apparatus for respira-

tion; the one aquatic, consisting of gills, ordinarily contained in a branchial chamber, (but in one species, at least, external,) suited for the separation of oxygen from the water, and the other aerial, consisting of true lungs, closely resembling those of serpents, though manifestly only a modification of the well-known swim-bladder of many fishes,—by means of which the animal breathes atmospheric air, during its periodic captivity.

The same emergency is met by other species in another way. It does not appear that the *Lepidosiren* has the power of voluntarily forsaking the water, or of travelling on land, notwithstanding its twofold respiration; but some of the fishes of the tropics certainly resort to this mode of evading the fatal contingency of being baked out by the evaporating power of the periodical dry season.

Theophrastus, the contemporary of Aristotle, mentions fishes found in the Euphrates which in the dry seasons leave the vacant channels and crawl over the ground in search of water, moving along by fins and tail.* Pallegoix gives three kinds of fish in Siam, which leave the tanks and channels and travel through the grass;† and Sir John Bowring states that in ascending the river Meinam to Bangkok, he was amused with the sight of fish leaving the stream, gliding over the wet banks, till they disappeared among the trees of the jungle.‡ The *Hydragyræ* of Carolina in like manner leave the drying pools, and seek the nearest water in a straight line, though at a

* *De Piscibus.* † *Siam*, i. 144. ‡ *Emb. to Siam*, i. 10.

considerable distance. And Sir R. Schomburgk tells us that certain species of *Dora* in Guiana have the same habit, and are occasionally met with in such numbers in their terrestrial travels that the negroes fill baskets with them. *

These fishes, provincially called Hassars, project themselves on their bony pectoral fins, aiding their advance by the elastic spring of the tail exerted sidewise, proceeding in this manner nearly as fast as a man can walk. The strong scaly bands which envelop the body facilitate the march, in the same way as the transverse plates (*scuta*) on the belly of serpents, which take hold of the ground, as the ribs perform the office of feet. The Indians know that these fishes have the power of carrying a supply of water in a reservoir, for the keeping of the gills in a moist condition. If they fail in finding water, they are said to burrow in the still soft mud, and pass the dry season in torpidity like the *Lepidosiren*.

The common eel is well known to have this habit of travelling with us; I well remember my surprise, when a boy, at finding an eel in a grassy meadow one dewy summer evening, at a considerable distance from water. Since then I have seen a small species of *Antennarius*, running quickly to and fro on the surface of the great beds of floating sea-weed in the Gulf stream, progressing by means of its pectorals and ventrals quite out of water, with the utmost facility.

The most celebrated example of this faculty, however,

* *Fishes of Guiana*, i. 113.

THE CLIMBING PERCH.

is the climbing perch (*Anabas scandens*) of India. The vagaries of this little fish have been recorded from the earliest times, and numerous modern witnesses have borne record to its powers. Mr E. Layard once encountered several travelling along a hot dusty gravel-road in the mid-day sun.* Daldorf, a Danish zoologist of reputation, asserts that he has seen this species in the act of climbing pálm-trees, effecting its ascent by means of fins and tail, with the aid of its spinous gill-covers. There is, however, some doubt whether he was not under mistake in this, though the fact of its crawling up the banks and living out of water is abundantly known.

On the coasts of Ceylon, according to its accomplished historian,—on the rocks which are washed by the surf, there are multitudes of a curious little fish, (*Salarias alticus,*) which possesses the faculty of darting along the surface of the water, and running up the wet stones, with the utmost ease and rapidity. By aid of its pectoral and ventral fins and gill-cases, it moves across the damp sand, ascends the roots of the mangroves, and climbs up the smooth face of the rocks in search of flies; adhering so securely as not to be detached by repeated assaults of the waves. These little creatures are so nimble, that it is almost impossible to lay hold of them, as they scramble to the edge, and plunge into the sea on the slightest attempt to molest them. They are from three to four inches in length, and of a dark-brown colour, almost indistinguishable from the rocks they frequent.†

* *Annals N. H., May* 1853.

† Tennent's *Ceylon*, ii. 498.

In all these cases probably, the power of sustaining a protracted privation of water depends on a peculiar structure of the pharynx, which is divided by membranous plates into cells which the fish can fill at pleasure with water, and by ejecting small portions at a time can moisten its gills, and thus preserve the filaments of these organs in a fit condition to maintain the circulation and oxygenation of the blood. These labyrinthal water-chambers are particularly numerous and complicated in the *Anabas* just mentioned. This, however, has no analogy with the lung of the *Lepidosiren*.

III.

MERMAIDS.

ACCORDING to Berosus there came up from the Red Sea, on the shore contiguous to Babylonia, a brute creature named Oannes, which had the body of a fish, above whose front parts rose the head of a man; it had two human feet, which projected from each side of the tail; it had also a human voice and human language. This strange monster sojourned among the rude people during the day, taking no food, but retiring to the sea again at night; and continued for some time, teaching them the arts of civilised life. Other ancient authors, as Polyhistor and Apollodorus, allude to the same tradition; and we gather that the portrait of the learned stranger (not painted *from the life*, we may presume, considering the condition of the people when he appeared, unless we may suppose it to have been the effort of one of his pupils in the pictorial art under his instruction) was preserved at Babylon to the historic period.

In an elaborate sculpture of the later Assyrian period, discovered by M. Botta at Khorsabad, a maritime expedition is portrayed, and the sea around the ships is filled with various marine animals, and among them the compound mythic forms of winged bulls and bull-lions, in

which the Assyrians delighted, together with a figure composed of the body and tail of a fish extended horizontally, and the perpendicular trunk and foreparts of a man, crowned with the sacred cap, possibly representing the traditional Oannes.

The god Dagon of the Philistines, and the goddess Atergatis of the Syrians were worshipped under the same combination of the human and piscine forms, and the Tritons of classical mythology perpetuated the idea.

It is curious that in almost all ages and in almost all countries there should have prevailed a belief in the actual living existence of creatures like this. Was the mythological symbol the origin of the persuasion? Or is there any marine animal uniting so much of the general form of the fish with that of man as to have given the conception of the idol? A naturalist of deserved eminence has maintained, on purely scientific grounds, that such an animal must exist,—that the laws of nature absolutely require such a being; and though the amount of force which his reasoning, possesses will be estimated differently according as we reject or accept the hypothesis of the circularity of the great plan of nature, we may as well see what he has to say for a marine primate,—be he man or ape, mermaid or mermonkey.

"There is yet," says Mr Swainson, "another primary type necessary to complete the circle of the quadrumanous animals, and it is that which we have elsewhere distinguished as the natatorial; but of such an animal we have only vague and indefinite accounts. It will be seen that,

throughout the whole class of quadrupeds, the aquatic types are remarkably few, and in general scarce; and that they contain fewer forms or examples than any other, and are often, in the smaller groups, entirely wanting. To account for this is altogether impossible; we can only call attention to the fact, as exemplified in the aquatic order of *Cetacea*, in that of the *Ferœ*, in the *Pachydermata*, in the circle of the *Glires*, and in all the remaining natatorial types of the different circles of quadrupeds. We do not implicitly believe in the existence of mermaids as described and depicted by the old writers—with a comb in the one hand and a mirror in the other; but it is difficult to imagine that the numerous records of singular marine animals, unlike any of those well known, have their origin in fraud or gross ignorance. Many of these narratives are given by eye-witnesses of the facts they vouch for—men of honesty and probity, having no object to gain by deception, and whose accounts have been confirmed by other witnesses equally trustworthy. Can it be supposed that the unfathomable depths of ocean are without their *peculiar* inhabitants, whose habits and economy rarely, if ever, bring them to the surface of the watery element? As reasonably might a Swiss mountaineer disbelieve in the existence of an ostrich, because it cannot inhabit his Alpine precipices, as that we should doubt that the rocks and caverns of the ocean are without animals destined to live in such situations, and such only. The natatorial type of the *Quadrumana*, however, is most assuredly wanting. Whatever its precise con-

struction may or might have been, it would represent and correspond to the seals in the circle of the *Ferœ*, or rapacious quadrupeds; while a resemblance to the *Simiadæ*, or monkeys, must be considered an essential character of any marine animal which is to connect and complete the circular series of types in the *Quadrumana*."

Mr Swainson absolutely excludes Man from the zoological circle, on grounds which few naturalists are disposed to think sufficient; else we might suggest that man himself is the natatorial type of the *Primates*. Taking this author's own selection* of the characters which mark the natatorial types of animals, for our guide, we find that the largest size, the smallest fore-limbs, the most obtuse muzzle, the most carnivorous appetite, and the most natatory habits (for I do not know that the Apes, or the Sapajous, or the Lemurs, or the Bats, ever take to the water voluntarily, whereas savage Man is always a great swimmer), belong to Man, and so, *Swainsonio ipso judice*, constitute *him* the true aquatic primate. But if so, we do not want a merman or mermonkey; nay, we should not know where to insert him in the zoological circle if we found him; he would be awkwardly *de trop*.

But yet nature *has* an awkward way of mocking at our impossibilities; and it *may be* that green-haired maidens with oary tails lurk in the ocean caves, and keep mirrors and combs upon their rocky shelves. Certainly the belief in them is very widely spread, and occasionally comes to us from quarters where we should hardly have looked for

* *Geog. and Classif. of Animals*, 249.

it. A negro from Dongola assured Prince Puckler Muskau that in the country of Sennaar there was no doubt that Sirens (mermaids) still existed, for that he himself had seen more than one.*

In my boyhood I well recollect being highly excited by the arrival in our town, at fair-time, of a "show," which professed to exhibit a mermaid, whose portrait, on canvas hung outside, was radiant in feminine loveliness and piscine scaliness. I fondly expected to see the very counterpart within, how disposed I did not venture to imagine, but alive and fascinating, of course. Had I not seen her picture? I joyfully paid my coppers, but oh! woful disappointment! I dimly saw, within a dusty glass case, in a dark corner, a shrivelled and blackened little thing which might have been moulded in mud for aught I could see, but which was labelled, "MERMAID!" So great was my disgust, so bitter my feelings of shame and anger at having been so grossly taken in, that I did not care to observe what might have been noteworthy in it. I read afterwards that it was a very ingenious cheat; the trunk and head of a monkey had been grafted on to the body and tail of a large salmon-like fish, and the junction had been so cleverly effected, that only a very close examination detected the artifice. It professed to have been brought from China, but possibly was an importation even thither, if Steinmetz is correct. According to this writer, "A Japanese fisherman contrived to unite the upper half of a monkey to the lower half of a fish, so neatly as to

* *Egypt and Mehemet Ali*, ii. p. 322.

defy ordinary inspection. He then gave out that he had caught the creature alive in his net, but that it had died shortly after being taken out of the water; and he derived considerable pecuniary profit from his cunning in more ways than one. The exhibition of the sea-monster to Japanese curiosity paid well; but yet more productive was the assertion that the half-human fish, having spoken the few minutes it existed out of its native element, had predicted a certain number of years of wonderful fertility, and a fatal epidemic, the only remedy for which would be possession of the marine prophet's likeness. The sale of these pictured mermaids was immense. Either this composite animal, or another, the offspring of the success of the first, was sold at the Dutch factory, and transmitted to Batavia, where it fell into the hands of a speculating American, who brought it to Europe, and here, in the years 1822-3, exhibited his purchase as a real mermaid at every capital, to the admiration of the ignorant, the perplexity of the learned, and the filling of his own purse. Indeed, the mermaids exhibited in Europe and America, to the great profit of the enterprising showmen, have all been of Japanese manufacture."*

This, however, will not account for the frequent reports of the living creatures having been seen, and unbelievers have to form some other hypothesis. In the tropical seas the cow-whales, uncouth marine *pachydermata*, have been assumed to be the originals of these stories. Megasthenes reported that the sea which washed Taprobane, the modern

* *Japan and her People*, p. 193.

Ceylon, was inhabited by a creature having the appearance of a woman; and Ælian improves the account by stating that there are whales having the form of satyrs. 'Tis true the Manatee and the Dugong are rather mer-swine than mer-maids; but there is something in the bluff round head which may remind a startled observer of the human form divine. Sir Emerson Tennent considers that this rude approach to the human outline, and the attitude of the mother while suckling her young, pressing it to her breast with one paw, while swimming with the other, the head of both being held perpendicularly above water, and then, when disturbed, suddenly diving and displaying her broad fin-like tail,—these, together with her habitual demonstrations of strong maternal affection, may probably have been the original from which the pictures of the mermaid were portrayed, and thus that earliest invention of mythical physiology may be traced to the Arab seamen and to the Greeks, who had watched the movements of the Dugong in the Red Sea and Indian Ocean.

The early Portuguese settlers in India had no doubt that true mermen were found in those seas; and the annalist of the exploits of the Jesuits narrates that seven of these monsters, male and female, were captured at Manaar in 1560, and carried to Goa, where they were dissected by Demas Bosquez, physician to the Viceroy, and "their internal structure found to be in all respects conformable to the human." Making allowance for the very limited acquaintance which the worthy physician was

likely to have made with human anatomy by actual autopsy, this statement goes for little:—the real resemblance, assuming them to have been Dugongs, was about the same as that presented by the hog, whose inwards are popularly believed by our own country people to be in very close accordance with those of "Christians."

Sir E. Tennent has embellished his book with a very taking portrait of the mermaid on the Dugong hypothesis; shewing two females, each holding a baby [is it right to say *merbaby?*], emerging from the sea-wave; they do look, to be sure, sufficiently human, but the well-known monogram of our clever friend Wolf in the corner of the cut suggests shrewd doubts that the portraits were not "*ad viv.*"

It is, perhaps, among the Scandinavian races that the belief in the merman has reached its culminating point. So many particulars are inculcated concerning the mode and conditions of life of these submarine beings, that the most intimate relations appear to have subsisted between the terrestrial and the aquatic peoples. According to the creed of the Norsemen, there exists, far beneath the depths of the ocean, an atmosphere adapted to the breathing organs of beings resembling in form the human race, endowed with surpassing beauty, with limited supernatural powers, but liable to suffering, and even to death. Their dwelling is in a vast region, situate far below the bottom of the sea, which forms a canopy over them, like the sky over us, and there they inhabit houses constructed of the pearly and coralline productions of the ocean.

Having lungs not adapted to a watery medium, but formed for breathing atmospheric air, it would be impossible for them to pass through the volume of waters that separates our world from theirs, if it were not that they possess the power of entering the skin of some marine animal, whose faculties they thus temporarily acquire, or of changing their own form and structure so as to suit the altered condition through which they are to travel. The most ordinary shape they assume is, as everybody knows, that of man (that is, their own proper form) from the waist upward, but below that of a fish. Whether they now breathe by gills or lungs, the anatomists, it seems, have not yet determined; we must presume the former alternative, since else it is not apparent what they have gained by their piscine metamorphosis of tail; though where the branchiæ are situate we are a little at a loss to imagine. These, however, are matters which doubtless the scientific world will one day determine: it seems certain that they do thus acquire an amphibious nature, so as not only to exist submerged in the waters, but to land on the shores of our sunny world, where they frequently doff their fishy half, resume their proper human form, and pass muster while they pursue their investigations here.*

Unfortunately, but one of these resources can ever be availed of by any individual mer-man or -maid, nor can any "son or daughter of the ocean borrow more than one sea-dress of this kind for his own particular use; therefore if the garb should be mislaid on the shores he never can re-

* See Hibbert's *Shetland Islands*, p. 506.

turn to his submarine country and friends. A Shetlander, having once found an empty seal-skin on the shore, took it home and kept it in his possession. Soon after, he met the most lovely being who ever stepped on the earth, wringing her hands with distress, and loudly lamenting, that, having lost her sea-dress, she must remain for ever on the earth. The Shetlander, having fallen in love at first sight, said not a syllable about finding this precious treasure, but made his proposals, and offered to take her for better or for worse, as his future wife! The merlady, though not, as we know, much a woman of the world, very prudently accepted the offer! I never heard what the settlements were, but they lived very happily for some years, till one day, when the green-haired bride unexpectedly discovered her long-lost seal-skin, and instantly putting it on, she took a hasty farewell of everybody, and ran towards the shore. Her husband flew out in pursuit of her, but in vain! She sprang from point to point, and from rock to rock, till at length, hastening into the ocean, she disappeared for ever, leaving the worthy man, her husband, perfectly planet-struck and inconsolable on the shore!"*

Nor are there lacking in the rocky cliffs of our own northern islands fit lodgings for these sea kings and queens. The gifted pen of Sir Walter Scott has sketched one of these from his own observation: "Imagination can hardly conceive anything more beautiful than the extraordinary grotto discovered not many years since upon

* Miss Sinclair's *Shetland.*

the estate of Alexander MacAllister, Esq. of Strathaird [in Skye]. The first entrance to this celebrated cave is rude and unpromising: but the light of the torches with which we were provided, was soon reflected from the roof, floor, and walls, which seemed, as if they were sheeted with marble, partly smooth, partly rough with frostwork and rustic ornaments, and partly seeming to be wrought into statuary. The floor forms a steep and difficult ascent, and might be fancifully compared to a sheet of water, which, while it rushed whitening and foaming down a declivity, had been suddenly arrested and consolidated by the spell of an enchanter. Upon attaining the summit of this ascent, the cave opens into a splendid gallery, adorned with the most dazzling crystallizations, and finally descends with rapidity to the brink of a pool, of the most limpid water, about four or five yards broad. There opens beyond this pool a portal arch, formed by two columns of white spar, with beautiful chasing upon the sides, which promises a continuation of the cave. One of our sailors swam across, for there is no other mode of passing, and informed us (as indeed we partly saw by the light he carried) that the enchantment of MacAllister's cave terminates with this portal, a little beyond which there was only a rude cavern, speedily choked with stones and earth. But the pool on the brink of which we stood, surrounded by the most fanciful mouldings, in a substance resembling white marble, and distinguished by the depth and purity of its waters, might have been the bathing grotto of a naiad. The groups of combined figures projecting or em-

bossed, by which the pool is surrounded, are exquisitely elegant and fanciful. A statuary might catch beautiful hints from the singular and romantic disposition of those stalactites. There is scarce a form or group on which active fancy may not trace figures or grotesque ornaments, which have been gradually moulded in this cavern by the dropping of the calcareous water hardening into petrifactions. Many of these fine groups have been injured by the senseless rage for appropriation of recent tourists; and the grotto has lost, (I am informed,) through the smoke of torches, something of that vivid silver tint which was originally one of its chief distinctions. But enough of beauty remains to compensate for all that may be lost."*

But these tales are the *nugæ canoræ* of the naturalist. Once more,—Is there any substratum of truth underlying these fancies? or must they be unhesitatingly dismissed to the region of fable? Certainly, if there were not two or three narratives which have an air of veracity and dependableness, bearing out the belief to some slight extent, I should not have noticed it here.

How simple and circumstantial is this story told by old Hudson, the renowned navigator! a man whose narrative is more than usually dry and destitute of everything like, not only imagination, but even an imaginative aspect of ordinary circumstances. On the 15th of June, when in lat. 75°, trying to force a passage to the pole near Nova Zembla, he records the following incident: "This morn-

* Notes to *The Lord of the Isles.*

ing one of our company looking overboard saw a mermaid; and calling up some of the company to see her, one more came up, and by that time she was come close to the ship's side, looking earnestly on the men. A little after, a sea came and overturned her. From the navel upward, her back and breasts were like a woman's, as they say that saw her; her body as big as one of us; her skin very white; and long hair hanging down behind, of colour black. In her going down they saw her tail, which was like the tail of a porpoise, and speckled like a mackerel. Their names that saw her were Thomas Hilles and Robert Rayner." *

Whatever explanation be attempted of this apparition, the ordinary resource of seal or walrus will not avail here. Seals and walruses must have been as familiar to these Polar mariners as cows to a dairy-maid. Unless the whole story was a concerted lie between the two men, reasonless and objectless,—and the worthy old navigator doubtless knew the character of his men,—they must have seen, in the black-haired, white-skinned creature, some form of being as yet unrecognised.

Steller, a zoologist of some repute, who examined the natural history of the Siberian seas, reports having seen, near Behring's Straits, a strange animal, which he calls a Sea-ape. "It was about five feet long, with a head like a dog's; the ears sharp and erect, and the eyes large; on both lips it had a kind of beard; the form of the body was thick and round, but tapering to the tail, which was

* *Hudson the Navigator*, by Asher, Voy. ii.

bifurcated, with the upper lobe longest; the body was covered with thick hair, grey on the back, and red on the belly. Steller could not discover any feet or paws. It was full of frolic, and sported in the manner of a monkey, swimming sometimes on one side of the ship and sometimes on the other, and looking at it with seeming surprise. It would come so near the ship that it might be touched with a pole; but if any one stirred, it would immediately retire. It often raised one third of its body above the water, and stood upright for a considerable time; then suddenly darted under the ship, and appeared in the same attitude on the other side; this it would repeat for thirty times together. It would frequently bring up a sea plant, not unlike a bottle-gourd, which it would toss about and catch again in its mouth, playing numberless fantastic tricks with it."

There is nothing in this description which would exclude it from well-recognised zoological classification. It is highly probable that it was one of the seal tribe, but of a species, perhaps a genus, not yet identified. All analogy would suggest that fore-paws must have been present in an animal with a dog-like head, and clothed with hair; but they were perhaps small,—smaller even than in other *Phocadæ*, and may have been so concealed in the long hair, or held so closely pressed to the body, as not to be visible. The only other difficulty is in the posterior extremity. This is described by Steller in terms that imply a true piscine tail, expanded in a direction vertical to the plane of the body, and of that peculiar

form called *heterocercal*, which distinguishes the cartilaginous families of Fishes, the Sharks and Rays. But the animal was indubitably a Mammal; and therefore we may almost with certainty assume that, if the body terminated in a natatory expansion, it would be, as in the whales, and manatees, a horizontal expansion, and not a vertical one. But if the strange creature was indeed, as I conclude, of the Phocine type, we have only to suppose the tail, which is usually very small in this family, to have been so greatly developed, as to exceed the united hind feet, which may have been small, and the appearance, seen momentarily, and in the wash of the waves, might well seem that of a heterocercal tail.

Captain Weddell, well known for his geographical discoveries in the extreme south of the globe, relates the following story: "A boat's crew were employed on Hall's Island, when one of the crew, left to take care of some produce, saw an animal whose voice was even musical. The sailor had lain down, and about ten o'clock he heard a noise resembling human cries; and as daylight in these latitudes never disappears at this season, he rose and looked around; but, on seeing no person, returned to bed; presently he heard the noise again; rose a second time, but still saw nothing. Conceiving, however, the possibility of a boat being upset, and that some of the crew might be clinging to some detached rocks, he walked along the beach a few steps, and heard the noise more distinctly, but in a musical strain. Upon searching round he saw an object lying on a rock a dozen yards from the shore,

at which he was somewhat frightened. The face and shoulders appeared of human form, and of a reddish colour; over the shoulders hung long green hair; the tail resembled that of the seal, but the extremities of the arms he could not see distinctly. The creature continued to make a musical noise while he gazed about two minutes, and on perceiving him it disappeared in an instant. Immediately when the man saw his officer, he told this wild tale, and to add weight to his testimony, (being a Romanist,) he made a cross on the sand which he kissed, as making oath to the truth of his statement. When I saw him, he told the story in so clear and positive a manner, making oath to its truth, that I concluded he must really have seen the animal he described, or that it must have been the effects of a disturbed imagination." *

The *green* hair in this description is the most suspicious element; it is so exactly that attributed to the poetical mermaids, and so entirely without precedent in the whole range of known zoology,—that, if taken literally, I fear it would condemn the narrative. But among the Antarctic seals, both golden yellow fur, and black fur, are found; and if hairs of these two colours were about equally intermingled, the result would be an olive-green, as we see in some of the monkeys; and then some allowance must doubtless be made for imagination, in one little accustomed to precise observation, and "somewhat frightened" withal. I should say, with little hesitation, that this creature was of the seal family, only that the seaman's

* *Voyage towards the South Pole*, p. 143.

daily habits brought him into the most familiar contact with various kinds of seals; and, unless the animal in question had differed notably from such as he was acquainted with, he would not have been so affected by the phenomenon. In such stories, the sorts of creatures familiar to the observation of the narrator, and the amount of surprise produced in his mind by the stranger,—must always be carefully estimated, as important elements in the formation of our judgment.

To come nearer home, Pontoppidan records the appearance of a merman, which was deposed to on oath by the observers: "About a mile from the coast of Denmark, near Landscrona, three sailors, observing something like a dead body floating in the water, rowed towards it. When they came within seven or eight fathoms, it still appeared as at first, for it had not stirred; but at that instant it sunk, and came up almost immediately in the same place. Upon this, out of fear, they lay still, and then let the boat float, that they might the better examine the monster, which, by the help of the current, came nearer and nearer to them. He turned his face and stared at them, which gave them a good opportunity of examining him narrowly. He stood in the same place for seven or eight minutes, and was seen above the water breast high. At last they grew apprehensive of some danger, and began to retire; upon which the monster blew up his cheeks, and made a kind of lowing noise, and then dived from their view. In regard to his form, they declare in their affidavits, which were regularly taken and recorded, that he appeared like

an old man, strong-limbed, with broad shoulders, but his arms they could not see. His head was small in proportion to his body, and had short curled black hair, which did not reach below his ears; his eyes lay deep in his head, and he had a meagre face, with a black beard; about the body downwards this merman was quite pointed like a fish.".*

But the most remarkable story that I know of in recent times, is that adduced by Dr Robert Hamilton, in his able History of the Whales and Seals, in the *Naturalist's Library*, he himself vouching for its general truth, from personal knowledge of some of the parties: "It was reported that a fishing-boat, off the island of Yell, one of the Shetland group, had captured a mermaid by its getting entangled in the lines!! The statement is, that the animal was about three feet long, the upper part of the body resembling the human, with protuberant mammæ like a woman; the face, the forehead, and neck, were short and resembling those of a monkey; the arms, which were small, were kept folded across the breast; the fingers were distinct, not webbed; a few stiff long bristles were on the top of the head, extending down to the shoulders, and these it could erect and depress at pleasure, something like a crest. The inferior part of the body was like a fish. The skin was smooth, and of a grey colour. It offered no resistance, nor attempted to bite, but uttered a low plaintive sound. The crew, six in number, took it within their boat, but superstition

* Pontoppidan's *Nat. Hist. of Norway*, p. 154.

getting the better of curiosity, they carefully disentangled it from the lines, and a hook which had accidentally fastened in its body, and returned it to its native element. It instantly dived, descending in a perpendicular direction.

"After writing the above, (we are informed) the narrator had an interview with the skipper of the boat and one of the crew, from whom he learned the following additional particulars. They had the animal for three hours within the boat; the body was without scales or hair; was of a silvery grey colour above, and white below, like the human skin; no gills were observed; nor fins on the back or belly. The tail was like that of the dog-fish: the mammæ were about as large as those of a woman; the mouth and lips were very distinct, and resembled the human.

"This communication was from Mr Edmonston, a well-known and intelligent observer, to the distinguished Professor of Natural History in the Edinburgh University, and Mr E. adds a few reflections, which are so pertinent, that we shall avail ourselves of them. That a very peculiar animal has been taken, no one can doubt. It was seen and handled by six men, on one occasion, and for some time, not one of whom dreams of a doubt of its being a mermaid. If it were supposed that their fears magnified its supposed resemblance to the human form, it must at all events be admitted that there was some ground for exciting these fears. But no such fears were likely to be entertained; for the mermaid is not an object of terror to the fisherman; it is rather a welcome guest, and danger

is to be apprehended only from its experiencing bad treatment. The usual resources of scepticism, that the seals and other sea-animals, appearing under certain circumstances, operating on an excited imagination, and so producing ocular illusion, cannot avail here. It is quite impossible that, under the circumstances, six Shetland fishermen could commit such a mistake." *

There is, no doubt, much in this account which signally distinguishes it from all other statements with which it can be compared, except that of Hudson's sailors, with which it well coincides. The protuberant mammæ, resembling those of a woman; the human, or at least simian face, forehead, and neck, and especially the mouth and lips; the distinct unwebbed fingers; the erectile crest of bristles; the nature of the surface,—without scales or hair; the colour; and the tail,—like that of a fish;—are all very remarkable points; and unless we conclude the entire story to be a lie, a mere barefaced hoax,—must necessarily indicate a creature of which scientific zoology knows absolutely nothing.

It is observable that, here again, the tail is said to have been piscine and heterocercal, "like that of the dog-fish:" while the naked skin, and the colour—silvery grey above and white below,—will well agree with the characteristics common to the smaller *Squalidæ*.

It is a pity that an account like this, avouched by six witnesses, was not thoroughly sifted. I have no doubt that, if a person tolerably conversant with zoology, and ac-

* *Edinburgh Magazine*, vol. xiii.

customed to the habit of cross-examination, had examined these six eye-witnesses *separately*, making full notes of what each could remember to have observed, and had then checked each deposition by all the others, a mass of testimony would have been accumulated that would in an instant have convinced any candid inquirer what measure of truth lay in the story. Points in which the whole six, or even three or four, agreed, might unhesitatingly have been set down as correct: suggestive questions, (not, however, suggesting the sort of answer,) as, "Had the creature so and so, or so and so?" could not have received the same reply from all the deponents, without being worthy of credence: even the points on which they would have differed might themselves have been instructive to an intelligent inquirer. I do not know that any such precautionary measures were resorted to in this case, and the tale must remain as we get it; but I make these observations for the purpose of suggesting, in the event of any similar occurrence, the advantage of *separate* examination in getting at the truth. On a review of the whole evidence, I do not judge that this single story is a sufficient foundation for believing in the existence of mermaids; but, taken into combination with other statements, it induces a strong suspicion that the northern seas may hold forms of life as yet uncatalogued by science.

IV.

THE SELF-IMMURED.

TURNING from reputed beings of which the very existence is the subject of doubt, let us consider one or two well-known and homely creatures, about which a certain degree of romantic interest hovers, because conditions of life are attributed to them by popular faith, which the general verdict of science denies.

One of the most remarkable examples in this category of *dubitanda*, is the oft-repeated case of Toads and similar animals found inclosed within the solid wood of living trees, or even within blocks of stone, with no discernible communication with the external air, or at least no aperture by which they could have entered their prison, yet, in every instance, alive. That insuperable difficulties stand *a priori* in the way of our believing in such conditions, no one familiar with animal physiology can deny; for, as Mr Bell observes, to believe that a Toad inclosed within a mass of clay, or other similar substance, shall exist wholly without air or food, for hundreds of years, and at length be liberated alive and capable of crawling, on the breaking up of the matrix,—now become a solid rock,—is certainly a demand upon our credulity which few will be ready to answer.

Yet, after all, it is a question that must not be decided *a priori*: it must rest upon evidence. It may be that here, too, fact is stranger than fiction; and we must not shut our eyes and ears to concurrent credible testimony, if it happen to bear witness to facts which we cannot account for. Truth will certainly be upon us, even though, ostrich-like, we thrust our head into a bush, and maintain that we cannot see it.

The learned historian of British Reptiles speaks with his characteristic candour upon the point. He admits that the many concurrent assertions of credible persons, who declare themselves to have been witnesses of the emancipation of imprisoned Toads, forbid us hastily to refuse our assent, or at least to deny the possibility of such a circumstance; while he demands better and more cautious evidence to authorise our implicit faith in these asserted facts.*

The ordinary mode of accounting for the phenomena, supposing them to be narrated in good faith, is that the animal "fell into the hollow where the men were at work, and was taken up by them in ignorance of the mode in which it had come there," or that "it may have hidden in the hollow of a tree during the autumn and winter, and on the return of spring found itself so far inclosed within its hiding-place as to be unable to escape." This latter suggestion would be more worthy of attention were the winter season the period in which, in our climate, periodical additions are made to the living wood, so as to

* Bell's *Brit. Rept.* (1839), 112.

narrow the entrance, or in which augmentations of bulk occurred to Toads, so as to prevent them from getting out where they got in;—but unfortunately the reverse of both suppositions is true. As to the former suggestion, while it may possibly serve to dismiss a few of the published statements, there are others which it would be absurd to explain thereby.

True to its principles of never shutting the door to the investigation of any natural history subject, the *Zoologist* has, during the eighteen years of its existence, been a medium for collecting and preserving facts bearing on this question. The pages of this periodical form an invaluable storehouse to the philosophic naturalist, who wishes to pursue his science undeterred by the ridicule of sciolism or the frown of authority. Let us search its treasures, then, expecting to find stories of diverse grades of credibility, of which the editor wisely leaves his readers to judge for themselves.

In May 1844, the Rev. J. Pemberton Bartlett of Kingston, in Kent, an experienced naturalist, mentions the following fact as having just come under his own notice:—"Only a few weeks since, in cutting down a fir-tree here, the workman discovered, completely imbedded in the centre, a Toad, which had doubtless been there some years, as the tree had completely grown over it; it must have been kept alive by absorbing the moisture of the tree. It was not in a completely torpid state, and after being exposed to the air a few hours, it crawled in true toad-like style. The age of the tree in which it was

found was, as far as I could judge from the number of circles, about twenty-five years." *

In reply to an inquiry whether he himself saw the Toad, and counted the timber-rings, Mr Bartlett favours me with the following note:—

"EXBURY PARSONAGE, NEAR SOUTHAMPTON,
February 22, 1861.

"DEAR SIR,— . . . . *I* quite believe that Toads *do* live in stone, but I have found it very difficult to get the facts from eye-witnesses. The imbedded Toad in the fir-tree, mentioned by me in the *Zoologist*, I saw, and, as stated there, I counted the rings of the tree. I believe it to have been the common Toad; but it looked rather more flabby, and not quite so round in its proportions, as toads generally do; in fact, instead of being 'puffed up' as they commonly are, it was considerably *down in the mouth*, from its close imprisonment! The cavity in which it was fixed appeared to have been originally a crack or fissure in the side of the tree; whether caused by decay, or made by a nuthatch or some other bird, I cannot say. The wound appeared to have healed, as the bark had apparently closed over it. The question now arises, Was the Toad *young* when it got into the hollow? and did it grow after it became a prisoner? Or had it come to years of discretion, when it took that unfortunate step, or rather crawl, into the cavity where it was so long to be imprisoned? And *why did* it remain there so quietly, while the bark gradually grew over its prison-house? The

* *Zoologist*, 614.

answer that I should give to the first of these questions would be, that probably it had arrived at a state of *toad-hood* when it took refuge in the tree, and *did not* grow afterwards. My theory why it remained ensconced there so quietly is this, that probably it might have been accustomed for some time to take refuge by day in this hole, from whence it would set out on its nocturnal rambles, and probably 'not go home till morning;' that on some occasion, 'when daylight did appear,' it returned to its accustomed haunt, and there squatted, winking and puffing, after its night's exploits, as toads are wont to do; that, on that luckless day, some felled tree or trees were laid up against the fir-tree that contained its abode, and that the tree or trees remained there till the bark closed so as to prevent its escape. What makes this idea the more probable is that the place where the fir-tree grew had, for probably years, been used as a place to store felled timber, as it was used for that purpose at the time I saw the Toad.

"After the discovery of this Toad in the fir-tree, I tried several experiments on Toads, by burying them in closely-sealed flower-pots, at a depth of nearly three feet. I much regret that I cannot find my notes on the subject; but I remember perfectly the main facts of one. The Toad was placed in a flower-pot, with another turned over it, and well cemented together—the two holes in both pots being also closely cemented up. It was buried between two and three feet deep in the garden. At the end of three months I took it up, and weighed the Toad, and found it had lost

a very little in weight. This I did again at the end of three months more; it was then quite lively, and had lost again but little in weight. I replaced it as before, and on taking it up the third time, I found the pots had, probably the cement not having been dry when buried, slipped on one side, and the moisture had got in, and consequently the poor Toad was dead, as well as buried! Now, surely if a Toad could live *six months* hermetically *sealed* in a flower-pot, without air or food—why not a much longer time? . . . .—Believe me, yours faithfully,

"J. PEMBERTON BARTLETT."

The Rev. W. J. Bree of Allesley, also an excellent zoologist, alluding to some queries by Mr E. Newman, communicated the following facts:—"I quite agree with you that the statements about Toads found in solid stone are mostly very unsatisfactory. One instance of the kind I have seen, as briefly stated, *Mag. Nat. Hist.*, ix. 316. The Toad appeared to me neither more nor less than our common species, although I certainly did not examine it scientifically. The stone was the new red sandstone of geologists; and was brought up, as I was told, some yards from below the surface. I understood the Toad, and the two portions of stone in which it was found inclosed, were deposited in some medical museum at Birmingham. The animal would not have been discovered but for an accident: the workmen were carting the stone away, and the block containing the Toad happened to be placed on the top of a great load, and accidentally fell from the cart

to the ground, and, breaking by the fall, brought to light the incarcerated reptile, which, I conclude, was somewhat injured by the fall, as there was a fresh wound on one side of the head, and it appeared to be blind of one eye. The Toad died, I was informed, the second day after it was discovered, partly, in all probability, in consequence of the injury. When I say the block of stone was *solid*, this statement requires some qualification: the two parts of the stone fitted together exactly, and quite close, except where the cavity was in which the Toad lay; but from this cavity there was evidently a flaw on one side towards the extremity, and a discolouring of the substance of the sandstone, so that although the two portions fitted together, they might not have been (on one side of the cavity) very firmly united. This circumstance, perhaps, may detract from the value of the example; nevertheless, it is unaccountable how the animal could have got into the position in which it was found: it is not conceivable, I think, that it should have been there ever since the first formation of the rock, and there certainly appeared to be no means by which it could have entered the rock in its present state, even admitting (what we know to be the fact) that Toads have the power of getting in and out of a very small orifice."

The author of the next account, signed "E. Peacock," is unknown to me; and it does not appear whether he speaks from personal observation or not. He says, "A few days ago, two labourers, employed at a stone quarry at Frodingham, near Brigg, Lincolnshire, found, at a depth

of five feet below the surface of the ground, and between two blocks of stone (lias), a living Toad: the interstice between the stones was filled with yellow clay, and there did not appear the least possible aperture by which anything could have passed." *

Even from remote India we have reports of the same phenomenon. A correspondent from Serampore sends the *Zoologist* the following:—"Last Wednesday, Feb. 7, 1849, on severing the branch of a tree, apparently of the tamarind species, I found a Toad in the centre of the wood, entirely excluded from light and air. The appearance of the animal was rather extraordinary. The body seemed full of air, and the skin soft and puffy, and of a light yellowish colour, with the exception of the extremities of the feet, which were hard and dark. The creature when exposed to the air seemed rather uncomfortable, and drew in its head just like a turtle when alarmed. It was thrown into a tank, when the water around, to the space of about a foot on either side, became perfectly white, like milk. It jumped out of the water immediately, apparently not liking the coldness. I did not have opportunity of observing it further, which I regret, as the animal got concealed in the long grass on the side of the tank, and was thus lost. The general supposition as to the mode by which animals get inclosed within trees, is their taking shelter in the cavity of a tree when very young, and the growth of the tree filling up the cavity, and thus imprisoning the animal. But this supposition, if true in the

* *Zool.*, 1879.

present case, makes the circumstance now related the more extraordinary. The tree is an old one, upwards of fifty feet high, and having a trunk more than three feet in diameter; and the height from the ground at which the Toad was found was about twelve feet. We must suppose the Toad to have got into the tree when within a foot from the ground: how many years old then must the animal be?"

The mention of the whitening of the water in which the Toad was immersed is to my mind a strong corroboration of the veracity of the preceding narrative. It is not a circumstance, at all likely to occur to a mere inventor, as it does not in the least bear on the question of incarceration, and there is no attempt to explain it. I have occasionally seen fluids rendered partially opaque by the outflow of a milky secretion from animals immersed in them, as in the case of the curious *Peripatus* of Jamaica, which, when put alive into spirits, discharges a considerable quantity of white fluid, which diffuses in the alcohol. The Toad was probably distinct from our common English species, but we know that the latter secretes a yellow acrid fluid in some abundance in the follicles of its skin, and this might be poured out under the excitement of alarm or anger.

In the summer of 1851, the Académie des Sciences was interested (according to the public papers) with this question. In digging a well at Blois, in June of that year, "some workmen drew up from about a yard beneath the surface a large flint, weighing about fourteen pounds, and on striking it a blow with a pickaxe, it split in two,

and discovered, snugly ensconced in the very centre, a large Toad. The Toad seemed for a moment greatly astonished, but jumped out, and rather rapidly crawled away. He was seized and replaced in the hole, when he settled himself down very quietly. The stone and Toad, just as they were, were sent to the Society of Sciences at Blois, and became immediately the subject of curious attention. First of all, the flint, fitted together, with the Toad in the hole, was placed in a cellar, and imbedded in moss. There it was left for some time. It is not known if the Toad ate, but it is certain that he made no discharge of any kind. It was found that if the top of the stone were cautiously removed in a dark place he did not stir, but that if the removal were effected in the light, he immediately got out and ran away. If he were placed on the edge of the flint, he would crawl into his hole, and fix himself comfortably in. He gathered his legs beneath his body; and it was observed that he took especial care of one of his feet, which had been slightly hurt in one of his removals. The hole is not one bit larger than the body, except a little where the back is. There is a sort of ledge on which his mouth reposes, and the bones of the jaws are slightly indented, as if from long resting on a hard substance. Not the slightest appearance of any communication whatsoever between the centre and the outside of the stone can be discovered, so that there is no reason to suppose that he could have drawn any nourishment from the outside. The committee, consisting of three eminent naturalists, one of whom has made Toads

his peculiar study for years, made no secret of their belief that the Toad had been in that stone for hundreds, perhaps thousands of years; but how he could have lived without air, or food, or water, or movement, they made no attempt to explain. They accordingly contented themselves with proposing that the present should be considered another authentic case, to be added to the few hundreds already existing, of Toads being found alive imbedded in stone, leaving it to some future savant to explain what now appears the wonderful miracle by which Nature keeps them alive so long in such places. But the distinguished M. Majendie suggested that it was just possible that an attempt was being made to hoax the Academy, by making it believe that the Toad had been found in the hole, whereas it might only have been put in by the mischievous workmen after the stone was broken. Terrified at the idea of becoming the laughing-stock of the public, the Academy declined to take any formal resolution about the Toad, but thanked the committee for its very interesting communication; and so the subject dropped."

This statement does not, to be sure, bear about it that character of precision which should mark the report of a scientific body, nor is it verified by authority; but the terror ascribed to L'Académie at the idea of being hoaxed, and the instant quashing of the inquiry, are so true to nature, so accurately characteristic of our august associations of savans, that I cannot help believing the story.

Here is another, which has the air of a *bonâ fide*

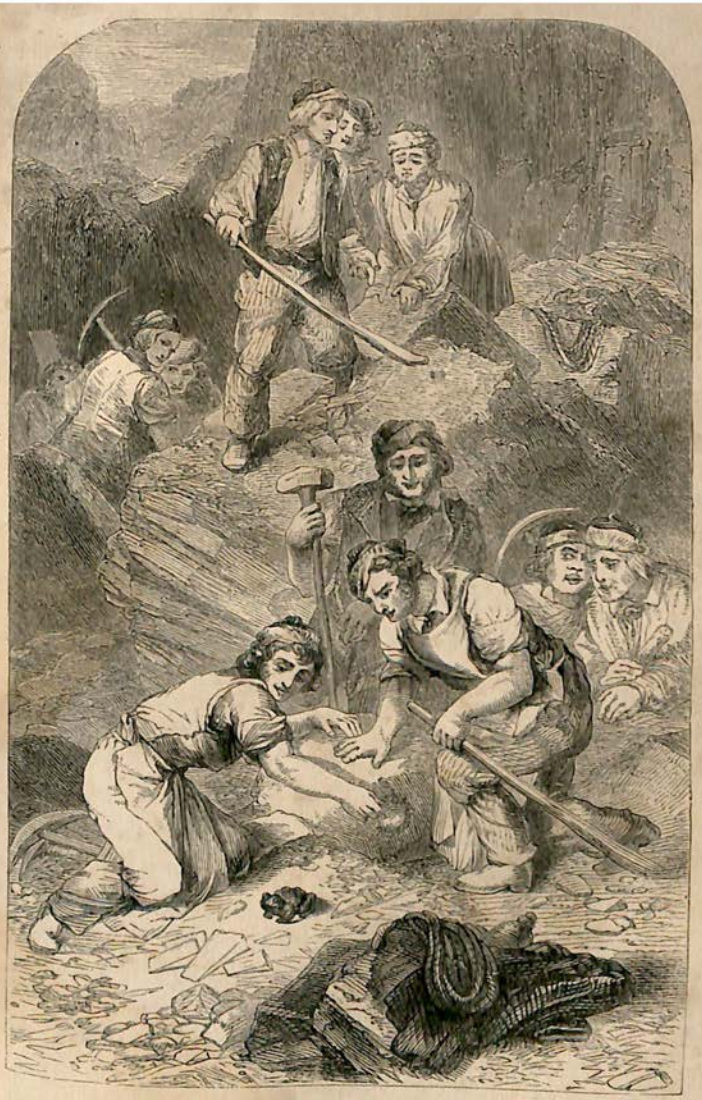
account, though I have no knowledge of the writer, nor does he himself seem to pretend to personal autopsy of the discovery.

On Monday last, September 20, while some workmen were engaged in getting iron ore at a place called Paswick, in the north of this county, [Derby,] they came upon a solid lump of ore, which, being heavier than two men could lift, they set to work to break with their picks, when, to their surprise, in a cavity near the centre of the stone, they found a Toad alive. The cavity was much larger than the Toad, being nearly six inches in diameter, and was lined with crystals of what I suppose to be carbonate of lime. The stone was about four yards from the surface of the ground; it is now in the possession of Mr Haywood of Derby, by whose men it was found; but unfortunately the Toad was not preserved after its death, which took place almost immediately on its exposure to the atmosphere.*

Audi alteram partem. Mr Plant of the Salford Museum tells us, both in sorrow and in anger, a story, doubtless more amusing to us who read it than to him, of his adventures among the toad-finders. When geologising in the neighbourhood of Chesterfield, a quarryman, whom he had invited to share a bottle of porter, informed him in confidence that Toads inclosed in stone were plentiful thereabout. "He said he had often found them, and that he knew a stone before it was broken that would contain a Toad; giving me long and circumstantial ac-

* *Zool.*, 3632.

counts of the whole phenomenon: and, to convince me of the truth of his statement, he took me to the quarry (a carboniferous sandstone) that I might see the stones out of which he said the Toads had been released. I examined the stones and the whole quarry very attentively, and listened to the emphatic testimony of other miners present. After complying in an agreeable manner to their remark that the day was warm, and the water of the quarry not much in favour, I made a simple proposal of this nature:—I promised to pay to any one of them the sum of twenty shillings for the next stone in which they found a Frog or Toad when the stone was broken in two. They should catch the Frog if he bolted out of the hole, replace him, and fit the stones together again, afterwards despatching it to me in that condition. I further promised to pay the sum of forty shillings to any one of them who should procure me a stone, unbroken, in which he considered a Toad or Frog was imprisoned, if, on breaking it myself, such turned out to be the case. These conditions were to remain in force for twelve months; and as the means of conveyance to my address, which I gave them, would occasion little or no trouble, the offer was readily accepted by the miners; who also, to express their confidence in soon being able to supply the order, proposed that it would be all safe if I advanced a little cash on account; which however I resolutely declined doing. And now what will the credulous believers in these 'Toads in stone' who read the *Zoologist* say, when they learn that I visited the quarry twice during the



TOAD IN A HOLE.

twelve months, in order to fetch the Toads which never came by rail? I always found the men there blasting tons of new rock, splitting stones for every building purpose, yet dry-throated and sullen; for, alas! most unaccountably during that long twelve months they found plenty of holes—not Toad holes—in the sandstone, but the reptiles had been banished as effectually as ever they were from the Emerald Isle." *

This was disheartening, certainly: and we do not wonder that Mr Plant became "a total disbeliever in these 'simple tales.'" Still, it is just possible, that immured Toads may exist, though Mikey of the Chesterfield quarry, in hope of the advance, did brag a little too confidently of the commonness of the occurrence. That, within one twelvemonth, within the limits of one quarry, no such Toad turned up, even under the stimulus of the proffered forty shillings, can scarcely be admitted to be absolutely conclusive proof of the negative, at least not to us who were not placed in the painful position of *gullees*. Mr Arthur Hussey of Rottingdean justly remarks, when presenting some evidence *per contra*, that we should not think the innocence of a culprit was established by his asserting, when sundry witnesses affirmed they saw him commit the offence he was accused of,—that he could produce ten times the number who would swear they *did not* see him.

"During the summer of 1846," writes Mr Hussey, "in the formation of a railroad, about half a mile from Ponte-

* *Zool.* 3803.

fract, in Yorkshire, the works were carried a 'depth of four feet through a rock betwixt lime and sandstone, about the junction of the two formations:' the rock being so firm as to require blasting. 'It is entirely free from beds of any kind, or what the workmen term "backs," running up it,' but therein are 'an infinite number of small nodules of a harder quality, entirely crystallised in the interior.' After blasting, the labourers were much surprised to find among the fragments several of these nodules, each one containing a Frog, as many as seven having been counted after one 'shot.'

"These were not casually seen when exposed, and then disregarded, but were examined in their stone prisons through very minute holes, some even preserved in that state for a long period. For example, the relator states of one specimen, 'I kept this Toad in a cellar for about five months, during which time it ate nothing, and was without light, the hole in the stone being covered with a piece of clay, and the whole kept moist and cool with water.' Of another he says, 'The Frog lived only about a week, as I kept it in a place which I think was too warm for it, and also not sufficiently dark and quiet. When the Frogs were disturbed by the shots, their first desire seemed to be to get under shelter of some stone, or into their old holes again, shewing thereby that sight was not wanting, and bodily activity was perfect as far as could be seen. One thing struck me as singular with regard to the Frog I kept—its fresh, plump, and healthy appearance, its skin being soft and transparent. One day,

when I was holding my finger over the hole in the stone, it pushed its head between my finger and the sides of the hole, and drew its whole body after it on to the table, where it appeared more like a skeleton than any living animal I have ever seen, but by degrees it extended itself to its former dimensions.'

"Of the above curious occurrence my only knowledge is derived from the account written to a distant friend, of which the substance has now been extracted. The writer is an utter stranger, but he was officially employed in the operations which resulted in the discoveries; and my information leads me to believe his report deserving of confidence, for which reason I have not hesitated to offer this abstract for publication in the *Zoologist*." *

The Rev. Alfred Charles Smith, an excellent and genial naturalist, favours us with another case, introducing it incidentally in illustration of the general habit he is denouncing of wantonly destroying animal life:—"As an instance of this thoughtless cruelty, I must give an account that has just come to my notice. Some labourers were pulling down an old wall, in the thickness of which they found one of those phenomena—so frequently heard of and so unsatisfactorily accounted for—a Toad completely imbedded in stone and mortar. 'There was no doubt,' said the labourer who described it, 'that he had been there for a great number of years, for there was no hole or chink by which he could have entered or left the place of his long sojourn.' 'Well,' said the listener to his

* *Zool.*, 3848.

account, 'but are you sure that the Toad was alive when you found it?' 'No doubt of that, sir,' said the man, 'for he crawled out of his round hole and was moving away, when I knocked him on the head with my pickaxe.'

"So here was this poor harmless creature, whose long incarceration in his gloomy dungeon might have excited compassion in his favour, suddenly released from his prison, only to be slain by his liberator!" *

The next is from the *Caledonian Mercury*. Newspaper zoology is proverbially untrustworthy, and the editor of the *Zoologist*, who reprints the paragraph, kindly adds a caveat for the benefit of his readers,—"*Nimium ne crede Mercurio!*" But, nevertheless, let us look at it: alone it would stand for little, but, remember, in such questions as this the evidence is cumulative. "There is at present to be seen at Messrs Sanderson and Sons, George Street, Edinburgh, an extraordinary specimen of natural history —a Frog which had been discovered alive in freestone rock. A few months ago, while some colliers in the employ of Mr James Nasmyth (lessee of Dundonald Colliery, in Fife, the property of R. B. Wardlaw Ramsay, Esq. of Whitehill), were engaged in taking out the pavement of the seam coal, which was freestone, they discovered a cavity in which a Frog was lying. On touching it the Frog jumped about for some time, and a bucket of water being procured, it was put into it, and taken to the surface. On reaching it, the animal was found to be dead. It was at the depth of forty-five fathoms, or ninety yards

* *Zool.*, 3904.

from the surface, in a perpendicular line of strata, consisting of alternate layers of coal and freestone, with ironstone, and about four hundred yards from the outcrop surface. The Frog seems to have much of the same character as the present species. It is very attenuated, which cannot be wondered at, considering its domicile for so many ages, its original existence being of course considered contemporaneous with the formation of the freestone rock in which it was contained."*

Now, again, we get the statement of a careful working naturalist, Mr Thomas Clark of Halesleigh. He cannot, indeed, give personal authority for what he records; but the confidence of such a man in his informant is an element not without its value. "March 25, 1859. In the early part of this month, two live Toads were dug out from the bottom of a bed of stiff brick clay, in the neighbourhood of Bridgewater, at the depth of fourteen feet from the surface of the ground; a third was killed by the spade before they were observed. This bed of clay rests on peat, and the Toads were found at the junction of the two beds, in a small domed cavity, about the size of the crown of a man's hat. On being exposed to the air, they uttered a squeaking cry, resembling that of a rat, but in about a minute they seemed reconciled to their new destiny, and moved freely about. They were kept in a jar for a few days, and then placed at liberty in a garden, where I suppose they are still living. The living ones were about two inches in length, but narrow in propor-

* *Zool.*, 5959.

tion, and of a rather lighter colour than Toads usually are; the one which was killed was very much larger. The clay under which they were buried had been gradually dug out from the surface since about the beginning of the year, but the last five feet of depth was not dug till the day on which they were discovered. After about two feet of the surface, the clay is very close and adhesive, and far too moist to admit of cracks being formed in it, even in the driest summers." *

To this communication inserted in the *Zoologist*, Mr Newman added a note asking the name of any scientific man who was present at the exhumation. Mr Clark replies:—"I am unable to give such a name, further than as the intelligent foreman of the brickyard, Thomas Duddridge, (who witnessed the exhumation by one of the labourers of the yard,) may be entitled to the appellation; but no one, however high his scientific attainments, could be more careful than he was to give me correct information, or more exact in his statements; and if, after minute inquiry, I had not been fully satisfied of the correctness of his account, I should not have sought to occupy the pages of the *Zoologist* with its recital. On shewing him the notice in the *Zoologist*, he said it was impossible for anything to be more correct; and he added, that the little cavity which the Toads occupied was quite smooth in every part, apparently by their long-continued movements,—as smooth, to use his own illustration, as the inside of a China bowl." †

* *Zool.*, 6537. † *Ibid.*, 6565.

Numerous experiments have been made with a view to test the possibility of these reputed facts. If Toads do so commonly become voluntarily or accidentally immured, and remain without light, food, or even air, for many years, and yet survive, let us put some Toads into similar circumstances, keep them shut up, and, after the lapse of a sufficient interval, examine them, and see whether they are alive or dead. "*Experimentum faciemus in corpore vili,*" as the village doctor said to his assistant over the sick traveller.

Probatum est! Besides the case mentioned in Mr Bartlett's letter (*ante*, p. 149), the late Dr Buckland, in November 1825, instituted a series of careful experiments, which are thus narrated by himself:—"In one large block of coarse oolitic limestone, twelve circular cells were prepared, each about one foot deep and five inches in diameter, and having a groove or shoulder at its upper margin fitted to receive a circular plate of glass, and a circular slate to protect the glass: the margin of this double cover was closed round and rendered impenetrable to air and water by a luting of soft clay. Twelve smaller cells, each six inches deep and five inches in diameter, were made in another block of compact siliceous sandstone, viz., the Pennant Grit of the coal formation near Bristol; these cells also were covered with similar plates of glass and slate, cemented at the edge by clay. The object of the glass covers was to allow the animals to be inspected, without disturbing the clay so as to admit external air or insects into the cell. The limestone is so porous that it is

easily permeable by water, and probably also by air; the sandstone is very compact.

"On the 26th of November 1825, one live Toad was placed in each of the above-mentioned twenty-four cells, and the double cover of glass and slate placed over each of them, and cemented down by the luting of clay. The weight of each Toad in grains was ascertained and noted by Dr Daubeny and Mr Dillwyn at the time of their being placed in the cells; that of the smallest was 115 grains, and of the largest 1185 grains. The large and small animals were distributed in equal proportion between the limestone and sandstone cells.

"These blocks of stone were buried together in my garden beneath three feet of earth, and remained unopened until the 10th of December 1826, on which day they were examined. Every Toad in the smaller cells of the compact sandstone was dead, and the bodies of most of them so much decayed that they must have been dead some months. The greater number of those in the larger cells of porous limestone were alive. No. 1, whose weight when immured was 924 grains, now weighed only 698 grains. No. 5, whose weight when immured was 1185 grains, now weighed 1265 grains. The glass cover over this cell was slightly cracked, so that minute insects might have entered: none, however, were discovered in this cell; but in another cell whose glass was broken, and the animal within it dead, there was a large assemblage of minute insects; and a similar assemblage also on the outside of the glass of a third cell. In cell No. 9, a Toad

which when put in weighed 988 grains, had increased to 1116 grains, and the glass cover over it was entire; but as the luting of the cell within which this Toad had increased in weight was not particularly examined, it is probable there was some aperture in it by which small insects found admission. No. 11 had decreased from 936 grains to 652 grains.

"When they were first examined in December 1826, not only were all the small Toads dead, but the larger ones appeared much emaciated, with the two exceptions above mentioned; we have already stated that these probably owed their increased weight to the insects which had found access to the cells, and become their food.

"The death of every individual of every size in the smaller cells of compact sandstone, appears to have resulted from a deficiency in the supply of air, in consequence of the smallness of the cells, and the impermeable nature of the stone; the larger volume of air originally inclosed in the cells of the limestone, and the porous nature of the stone itself, (permeable as it is slowly by water, and probably by air,) seem to have favoured the duration of life to the animals inclosed in them without food.

"It should be noticed that there is a defect in these experiments, arising from the treatment of the twenty-four Toads before they were inclosed in the blocks of stone. They were shut up and buried on the 26th of November, but the greater number of them had been caught more than two months before that time, and had

been imprisoned all together in a cucumber frame placed on common garden earth, where the supply of food to so many individuals was probably scanty, and their confinement unnatural, so that they were in an unhealthy and somewhat meagre state at the time of their imprisonment. We can therefore scarcely argue with certainty from the death of all these individuals within two years, as to the duration of life which might have been maintained had they retired spontaneously, and fallen into the torpor of their natural hybernation in good bodily condition.

"The results of our experiments amount to this: all the Toads, both large and small, inclosed in sandstone, and the small Toads in the limestone also, were dead at the end of thirteen months. Before the expiration of the second year all the large ones also were dead; these were examined several times during the second year through the glass covers of the cells, but without removing them to admit air; they appeared always awake, with their eyes open, and never in a state of torpor, their meagreness increasing at each interval in which they were examined, until at length they were found dead; those two also which had gained an accession of weight at the end of the first year, and were then carefully closed up again, were emaciated and dead before the expiration of the second year.

"At the same time that these Toads were inclosed in stone, four other Toads of middling size were inclosed in three holes, cut for this purpose on the north side of the trunk of an apple-tree; two being placed in the largest

cell, and each of the others in a single cell. The cells were nearly circular, about five inches deep and three inches in diameter; they were carefully closed up with a plug of wood, so as to exclude access of insects, and apparently were air-tight; when examined at the end of a year, every one of the Toads was dead, and their bodies were decayed.

"From the fatal result of the experiments made in the small cells cut in the apple-tree and the block of compact sandstone, it seems to follow that Toads cannot live a year excluded totally from atmospheric air; and, from the experiments in the larger cells within the block of oolitic limestone, it seems also probable that they cannot survive two years entirely excluded from food; we may therefore conclude that there is a want of sufficiently minute and accurate observation in those so frequently recorded cases, where Toads are said to be found alive within blocks of stone and wood, in cavities that had no communication whatever with the external air. The fact of my two Toads having increased in weight at the end of the year, notwithstanding the care that was taken to inclose them perfectly by a luting of clay, shews how very small an aperture will admit of insects sufficient to maintain life. In the cell No. 5, where the glass was slightly cracked, the communication though small was obvious, but in the cell No. 9, where the glass cover remained entire, and where it appears certain, from the increased weight of the inclosed animal, that insects must have found admission, we have an example of these minute animals finding their

way into a cell to which great care had been taken to prevent any possibility of access.

"Admitting, then, that Toads are occasionally found in cavities of wood and stone with which there is no communication sufficiently large to allow the ingress and egress of the animal inclosed in them, we may, I think, find a solution of such phenomena in the habits of these reptiles, and of the insects which form their food. The first effort of the young Toad, as soon as it has left its tadpole state and emerged from the water, is to seek shelter in holes and crevices of rocks and trees. An individual which, when young, may have thus entered a cavity by some very narrow aperture, would find abundance of food by catching insects, which, like itself, seek shelter within such cavities; and may soon have increased so much in bulk as to render it impossible to get out again through the narrow aperture at which it entered. A small hole of this kind is very likely to be overlooked by common workmen, who are the only people whose operations on stone and wood disclose cavities in the interior of such substances.

"In the case of Toads, Snakes, and Lizards, that occasionally issue from stones that are broken in a quarry, or in sinking wells, and sometimes even from strata of coal at the bottom of a coal-mine, the evidence is never perfect to shew that the reptiles were entirely inclosed in solid rock. No examination is ever made until the reptile is first discovered by the breaking of the mass in which it was contained, and then it is too late to ascertain, without

carefully replacing every fragment, (and in no case that I have seen reported has this ever been done,) whether or not there was any hole or crevice by which the animal may have entered the cavity from which it was extracted. Without previous examination it is almost impossible to prove that there was no such communication. In the case of rocks near the surface of the earth, and in stone quarries, reptiles find ready admission to holes and fissures. We have a notorious example of this kind in the Lizard found in a chalk-pit, and brought alive to the late Dr Clark. In the case also of wells and coal-pits, a reptile that had fallen down the well or shaft, and survived its fall, would seek its natural retreat in the first hole or crevice it could find, and the miner dislodging it from this cavity, to which his previous attention had not been called, might in ignorance conclude that the animal was coeval with the stone from which he had extracted it.

"It remains only to consider the case (of which I know not any authenticated example) of Toads that have been said to be found in cavities within blocks of limestone, to which, on careful examination, no access whatever could be discovered, and where the animal was absolutely and entirely closed up with stone. Should any such case ever have existed, it is probable that the communication between this cavity and the external surface had been closed up by stalactitic incrustation, after the animal had become too large to make its escape. A similar explanation may be offered of the much more probable case of a live Toad being entirely surrounded with solid wood. In

each case, the animal would have continued to increase in bulk so long as the smallest aperture remained by which air and insects could find admission; it would probably become torpid as soon as this aperture was entirely closed by the accumulation of stalactite or the growth of wood. But it still remains to be ascertained how long this state of torpor may continue under total exclusion from food and from external air: and, although the experiments above recorded shew that life did not extend two years in the case of any one of the individuals which formed the subjects of them, yet, for reasons which have been specified, they are not decisive to shew that a state of torpor, or suspended animation, may not be endured for a much longer time by Toads that are healthy and well fed up to the moment when they are finally cut off from food, and from all direct access of atmospheric air.

"The common experiment of burying a Toad in a flower-pot covered with a tile, is of no value unless the cover be carefully luted to the pot, and the hole at the bottom of the pot also closed, so as to exclude all possible access of air, earthworms, and insects. I have heard of two or three experiments of this kind, in which these precautions have not been taken, and in which at the end of a year the Toads have been found alive and well.

"Besides the Toads inclosed in wood and stone, four others were placed each in a small basin of plaster of Paris, four inches deep and five inches in diameter, having a cover of the same material carefully luted round with clay; these were buried at the same time and in the same

place with the blocks of stone, and on being examined at the same time with them in December 1826, two of the Toads were dead, the other two alive, but much emaciated. We can only collect from this experiment, that a thin plate of plaster of Paris is permeable to air in a sufficient degree to maintain the life of a Toad for thirteen months.

"In the 19th Vol., No. I., p. 167, of *Silliman's American Journal of Science and Arts*, David Thomas, Esq. has published some observations on Frogs and Toads in stone and solid earth, enumerating several authentic and well-attested cases. These, however, amount to no more than a repetition of the facts so often stated and admitted to be true, viz., that torpid reptiles occur in cavities of stone, and at the depth of many feet in soil and earth; but they state not anything to disprove the possibility of a small aperture, by which these cavities may have had communication with the external surface, and insects have been admitted.

"The attention of the discoverer is always directed more to the Toad than to the minutiæ of the state of the cavity in which it was contained."

The importance of these experiments, the care with which they were instituted, the deserved reputation of the experimenter, and the philosophic character of his inferences, will, I trust, apologise for the extent of this quotation. I do not think, however, that the question is settled by them; and I will venture to make one or two comments on the facts and on the observations.

Dr Buckland allows that the circumstances of the

incarceration of his Toads were not natural. This seems to me an element of more importance than he attributes to it. They were shut up while in active life, after having been confined for two months on scanty food;—"So that they were in an *unhealthy and somewhat meagre* state at the time of their imprisonment." We do not know what conditions, what natural provisions precede torpidity and are essential to it; but possibly there are some, which in these cases were compulsorily precluded by human interference. It is stated that the animals that survived to the second year were always found awake when examined, —"*never in a state of torpor.*" But Toads that had hid themselves would have been torpid during the winter months; and thus we have a sufficient proof that a natural condition of body had been by some means prevented. The experiment would be much more fair to the Toad, and much more conclusive to me, if the animal were inclosed during the depth of its winter-sleep, care being taken to handle it as little as possible.

As it was, however, *most of the Toads* inclosed in the limestone *survived upwards of thirteen months.* This surely is a very remarkable fact. Take the case of No. 9. Here was a Toad, nearly full grown, which had been shut up in a stone cell, covered with a plate of glass carefully luted down all round, so as to exclude air, buried under three feet of earth, so as to exclude the smallest gleam of light; yet, at the expiration of thirteen months, the cell being examined in winter, when normally all Toads ought to be sound asleep, this Toad was wide awake, not in the

least emaciated, but so thriving in its strange dungeon as actually to have made 128 grains of flesh! to have actually increased in weight at the rate of 12½ per cent.!

Dr Buckland says, "It is probable there was some aperture in the luting by which small insects found admission." But this is altogether a *petitio principii:* it absolutely begs the question at issue. Are not these insects entirely gratuitous? The luting was, of course, carefully laid on: there could be no drying to cause contraction, buried as it was in the earth; the glass was uninjured; no orifice was detected; and yet, forsooth, it must be assumed that "small insects found admission." Then, too, consider the problem. It is not the possibility that a microscopically minute insect or two may have managed in some inscrutable way to insinuate themselves, but insects sufficient to support this large Toad for thirteen months, and to make it at the end of that time 128 grains heavier than it was when first inclosed! There is the fact, as stated by this careful observer; and I am sure his hypothesis of intrusive insects will not account for it.

I might make similar remarks on No. 5. The glass was "*slightly* cracked." No insects were discovered in it; nor is any perceptible orifice alluded to; yet this Toad had increased from 1185 grains to 1265 grains. The "*slight* crack" in the glass makes this example less remarkable at first sight than the other; but in reality it is equally inscrutable. Insects, however minute, do not pass through glass merely cracked; but the requirement

is the admission of insects enough to make an increase of flesh of 80 grains' weight, besides maintaining the waste of the Toad during thirteen months. Where, in each case, was the excrement corresponding to such an augmentation? An insect-diet, as every naturalist knows, leaves a very considerable residuum of indigestible, incorruptible, chitinous matter: the fœcal remains of an insect-diet sufficient to keep an adult Toad in condition for thirteen months, and leave him 128 grains heavier than at first, would form no inconsiderable or inconspicuous mass. Yet the silence of the observer on so conclusive an evidence proves that it was utterly wanting.

The Toads which survived longest were the largest specimens. Perhaps it requires a condition of peculiar vigour to bear the incarceration. Even these were all dead before two years had elapsed. But then it must be remembered that they had been disturbed: they had been taken out, handled, and weighed, and replaced; and during the second year they had been examined "several times." Air, it is true, was not admitted in these later examinations; but *light was;* and it may be that the absence of all external stimulus (and light is a potent one) is indispensable to the prolongation of vitality under conditions so abnormal.

No one supposes that incarceration in solid rock is an ordinary event in the life of even a Toad. However it occur,—granting that it may occur,—it must surely be a rare accident happening to an individual here and there, from which millions of Toads are exempt. We

may reasonably suppose, too, that not one in a hundred so accidentally incarcerated would survive, the accident in the majority of cases proving fatal. If we bear in mind these not unreasonable presumptions, we shall not hastily decide that all the recorded discoveries of Toads immured are proved false and impossible, because we have not succeeded in finding a case of longevity out of four-and-twenty Toads, many of them little ones, which we took and violently immured at our pleasure.

To my own mind these interesting experiments are far more corroborative than contradictory of the popular belief. The amazing fact remains, that an adult vertebrate air-breathing animal can certainly live, and increase in size, shut up in a stone cell, debarred from light and air and food, for a period between one and two years! What have we parallel to this in the whole range of natural history? *C'est le premier pas qui coûte.* After the first year has passed so auspiciously, why may not a second? a third? and so indefinitely—under circumstances peculiarly favouring? It is by no means certain that there are not such favouring circumstances, because we cannot precisely predicate what they are. And if we admit the reported cases to be—only a few of them—true, we cannot evade the conclusion, that the longevity of these imprisoned Toads must be immense, incalculable. For a Toad that emerges when a block of stone is split up, from a matrix that fits (say somewhat roughly, if you please) its form and size, must have been there ever since the stone was in a soft state, how long soever that may

have been. Nor does it in the least affect the question, that there may have been some minute crack in the matrix through which insects, sufficient to support life, entered. This circumstance, I say, if satisfactorily proved, would not touch the question of time. And surely it is a marvel of colossal magnitude that a vertebrate animal should have maintained its life shut up in a mass of stone ever since the deposition of the matter in a solid form, even though we be able to eliminate from it the element of total abstinence during the entire period.

But facts are upon record which prove the possibility of Toads surviving a protracted incarceration, effected by man, and therefore without their will. In 1809, on opening a gap in a wall at Bamborough, in Northumberland, for the passage of carts, a Toad, which had been incarcerated in the centre of a wall, was found alive, and set at liberty. A mason, named George Wilson, when building this wall, sixteen years before, had wantonly immured the animal, in a close cavity formed of lime and stone, just sufficient to contain it, and which he plastered so closely as seemingly to prevent the admission of air. When discovered, it seemed at first, as must naturally be supposed, in a very torpid state; but it soon recovered animation and activity, and, as if sensible of the blessings of freedom, made its way to a collection of stones, and disappeared.*

Mr F. W. L. Ross of Broadway House, near Topsham, an acute and experienced naturalist, narrates the follow-

* Richardson's *Borderer's Table Book*, iii. 92.

ing circumstances:—"In the year 1821, I was residing in the country, and in my court-yard was a set of stone steps for mounting on horseback. These being useless to me, I desired they might be removed. On taking them down, the lowest step, a coarse red conglomerate, measuring about three feet in length, ten inches in depth, and about fourteen in width, was raised by a heavy bar. It had been well bedded in mortar, in which, while soft, a Toad had been evidently placed, as there was no appearance of any way by which it could have found ingress or egress, the mould or cast being as perfect as if taken in plaster. On the removal of the stone, the Toad remained torpid for a few minutes, when it seemed to revive, and then crept out. From the owners of the property I ascertained that the steps had been placed there forty-five years before, and, to the best of their knowledge, had never been moved.

"The second account is from a clergyman, and originated in my informing him of the above. He caused a pit to be dug in his garden, six feet deep; at the bottom was laid a slate, on which a full-sized Toad was placed, with an inverted flower-pot over it. The hole and edges were well luted with clay; the pit was then filled in, and on that day twelve months reopened, when the Toad was found alive, and as well as when inclosed in its living tomb. If, therefore, it could exist in such a state for twelve months, it is not impossible that it might do so for a much longer period." *

These curious facts derive confirmation and augmented

* *Zool.*, 3266.

interest from some apparently parallel conditions observed of other animals, widely removed in the organic scale from the Reptilia, and that on both sides. Some glimpses of an indefinitely protracted torpidity in Wasps are given to us in a communication from an eminent entomologist, Mr G. Wailes of Newcastle, to the Entomological Society of London, and published in their "Proceedings" of March 5, 1860. These Rip Van Winkles of the insect race choose, it seems, the tops of loftiest mountains for going to their long sleep. Who knows what might be found if a clever insect-hunter were to go stone-turning on the peaks of Ararat? Read the following, young enterprising entomologists! and set out.

"It is very evident that we have a great deal yet to learn about the Social Wasps, and therefore the following remarks as to *Vespa vulgaris* may be interesting. Ever since 1829 I have, at intervals, searched the summit of Skiddaw (3022 feet) for specimens of *Leistus montanus*, and on every occasion have taken out from underneath the loose fragments of the slate perfectly torpid females of this Wasp, with the wings, legs, antennæ, &c., precisely in the state in which we find them during winter in the lower lands. Not unfrequently I have met with dead specimens which seemed to have perished in the same dormant state, and been there for a year or two at least. Mr Smith, in his catalogue of the British Vespadæ, under this species, states that Mr Wollaston found the female abundant under stones on the extreme summit of Gribon Oernant, near Llangollen, in September 1854, adding,

'probably hybernating for the winter,' but had evidently forgotten my writing to him on the subject. My visits to the mountain have extended from the latter end of June to the latter end of August, and therefore it necessarily follows that either these specimens of the female Wasp were those of the previous year, or that this sex appears much earlier in the season than has hitherto been supposed. But in either case the question arises, why are they torpid during these the hottest months of the year? It is quite true that the temperature of the altitude is below that of the plains, especially during the night, and I have myself been enveloped in falling sleet and snow more than once, both in June and August, though, as a rule, the Cumberland mountains seldom have a thick covering of snow, and often only a few inches once or twice in the winter. Still, the temperature of ordinary mountains always approaches that of the plains in summer, and, one would have expected, was in Britain at least sufficiently high to rouse these Wasps in their winter quarters, when every other insect under the same stones was active and stirring, and the air so warm and bright that *Larentia salicata* and *Crambus furcatillus* were sporting in the mid-day sun above them. Such, however, was not the case, and when turned out of their snug, dry quarters, they allowed themselves to be handled and put into pill-boxes just as they do in winter. We may therefore ask, when are these sleepers to awake? for as the ground temperature reaches its maximum during the months in which I have met with them, and Mr Wollas-

ton has found them in a similar state in September, when a declining temperature has set in, we must conclude that for that year all prospect of their subsequent issue from their retreats through the influence of heat is barred. Can this be called hybernation, as it is usually understood? Or is there some other cause of torpidity besides mere cold? Or are we to conclude that when once put to sleep in these lofty regions, they wake no more unless kindly removed into a milder clime by a stray entomologist, when, as I have always noticed, they become as active as those of the warm lowlands?"*

Mr Westwood, in the conversation that ensued on this communication, suggested that these female Wasps had been the founders of colonies in the preceding spring, and, after performing their maternal duties, had retired to die in the situations in which they were found by Mr Wailes. But with all due deference to so great an authority, is not this another example of those "explanations" which are thrown off without a due consideration of the exigencies of the case in hand—explanations which really explain nothing? For though this hypothesis might account for Wasps found under such conditions in June, it will not do for the September findings. Insects that had performed the end of their existence and had retired to die in June, would not live through July and August, and be found alive in September. Besides, Mr Wailes distinctly affirms, that *they always become active* when removed to a milder clime, which is proof positive that they had not retired to

* *Zool.*, 6941.

die. Mr Smith's hypothesis, that they are "probably hybernating for the winter," will not account for their torpidity in June and July. Mr Westwood's hypothesis, that they are moribund individuals after their spring work, will not explain their vitality till September, and their revivification when removed.

But these are insects; and the difference between vertebrate and invertebrate life is so vast that, after all, the possibilities of the latter may not have much bearing on those of the former. What, then, shall we say to an indefinite prolongation of life under like dreary conditions in—*Bats?* *Bats*, which are true vertebrata; and no amphibia grovelling at the bottom of the vertebrate ladder, where the dim flame of spinal life is just glimmering in the socket, but *Mammalia*, and those of nearly the highest type;—*Bats*, which Linnæus associated with *Homo sapiens* himself in his first Order *Primates!* Can *these* live for years shut up from light and food and air? these great-chested, well-lunged, warm-blooded, aerial quadrupeds? "Impossible! I would not believe it, if ——" Stay! make no rash vows; but read, weigh, and judge. Remember,—both the following statements are by clergymen, each of whom is a well-known, careful, experienced naturalist.

"A very curious instance," says Mr Pemberton Bartlett, "of the great length of time that a Bat can remain in a state of torpidity, came under my notice about three weeks since; and as I believe instances of the kind are but rarely observed, perhaps an account of the facts of

the case may not prove uninteresting. Upon opening a vault in Bishopsbourne church, the bricklayer observed a large Bat clinging to the wall. Thinking it a curious thing to find a Bat in a vault which he knew had not been opened for twenty years, in the evening he sent it to me by his boy, who, when he arrived at the door, was tempted to open the basket to look at the inmate, when most unfortunately it made its escape, and flitted into a leaden spout which was placed against the house, from whence I was unable to recover it. Upon learning the particulars of its discovery, I made a careful search about the vault, but was unable to trace any hole or crack through which the smallest Bat could have crept. The bricklayer also informed me that there was no place where a Bat could have entered, in the part where he opened the vault, as the entrance was bricked up, and over the steps was a slab which fitted close. If, indeed, it had been possible for a Bat to have got between this, the brickwork at the entrance would most effectually have prevented it from finding an asylum in the vault. The natural inference therefore is, that the Bat must have got into the vault when it was last opened, and consequently had been entombed since the year 1823! It was most unfortunate that I was unable to decide what species it was; but, from the bricklayer's description, I think it must have been *Vespertilio Pipistrellus*. When first taken out of the vault it was in a torpid state, but the effects of the air may be imagined from its taking the first opportunity to escape in the evening; it flew, how-

ever, far more 'leaden winged' than ever bats are wont to fly, which was by no means marvellous, when we consider it had been out of practice for twenty-one years." *

The next account, by the Rev. A. C. Smith, of Yatesbury Rectory, Calne, is one of peculiar interest. The narrator actually witnessed the discovery. His investigation was pursued with the cautious care, and his statement is made with the precision, which belong to science; and the details are so full, and his remarks so appropriate, that though the story is somewhat long, I cannot bring myself to abridge it. It bears date, Feb. 18, 1854. Of course, the reader will note how these two narratives yield each other mutual corroboration.

"While effecting some repairs in the pavement of the aisle of my church, a short time since, the masons found it necessary to remove some bricks from the solid wall of an adjacent vault, in order the better to adjust an iron bar intended to support the superincumbent flagstone. It seems that one of two bricks being removed, and several large and handsome coffins being exposed to view, curiosity tempted one of the workmen to reach his hand in with a lighted candle, in order to see the names and dates on the coffins; the result of which investigation shewed that the last coffin was placed there in 1748. During this search I entered the church, just in time to witness the extreme surprise, and the no little consternation, of the man, whose hand had suddenly come in contact with a Bat, suspended from the roof of the vault.

* *Zool.*, 613.

The Bat was soon brought to light; and, in its half-torpid state, placed in my hand. We then proceeded to make a very minute examination of this vault with a lighted candle, in order to discover, if possible, by what means the Bat could have penetrated to its resting-place: but, although our search was very careful and long continued, we failed to discover the smallest crack or crevice in which a pin could be thrust. The roof was an arch of brick, surmounted by flagstones; the sides were solid masonry, bearing no appearance internally of decay; and the position of the vault was very near the centre of the church: so that I was much puzzled to account for the occurrence of the Bat in a place apparently hermetically sealed for above a hundred years; and knew not how to combat the opinion of the workmen, that it must have been entombed there alive since the year 1748.

"I now proceeded to institute inquiries regarding the vault in which the Bat was found. The marble monument above, recorded the names of an old Wiltshire family long since extinct in these parts, and the dates of the three coffins below, corroborating the statement of the brass plate, that the individual last buried died A.D. 1748. Several old men in the parish remembered an adjacent vault being opened, when they were boys, nearly sixty years since: but all positively denied that the vault in question had ever been opened in their lives: and one, a very old man, formerly clerk, and whose then residence abutted on the churchyard, was very emphatic on this point. So that I am constrained to believe that the vault

has remained untouched since it received its last occupant, a hundred and six years ago: and I am the more convinced of this from the excessive freshness of the last coffin, the brass plate and nails of which are as bright, and its whole appearance as new, as if it had been placed there but yesterday, which would not have been the case had the external air been admitted at any time since the vault was closed.

"During the time of the examination of the vault, the Bat was held in my hand, and above an hour must have elapsed since its capture before I was enabled to take it to the Rectory, and place it under an inverted glass: by this time the warmth of my hand had considerably revived it, and it wandered round its prison, snuffing about with its curious nose, and standing up, and trying to hook itself on to the smooth glass, which baffled all its attempts. As it obstinately refused to eat small pieces of chopped meat, with which I tempted it to break its fast, which may have continued a hundred and six years, and after which I should have imagined it to be ravenous; and as it lay on its side, apparently in a dying state, humanity urged me to give it a chance of life, by restoring it to liberty, and I accordingly carried it to the garden, where I placed it upon the turf, and watched its movements. At first it clung to the blades of grass, and shivered a good deal; presently it fluttered along the ground; soon it rose upon the wing, though in an awkward manner, and although it sank several times, as if about to fall to the ground, and as if it had not found the use of its wings,

(which might have been a little stiff for want of exercise, if they had been closed above a hundred years), it passed behind a clump of trees and I saw it no more; and then I began to regret, when too late, that I had not made more efforts to keep it alive and watch its recovery. I know little of the different species of Bats, but, from its diminutive size, and extremely long ears, I should imagine it to be the *Vespertilio auritus* of Gilbert White.

"Now, if the hypothesis be deemed absurd that the Bat had been immured in the vault since 1748, how then are we to account for its presence there? For although I am aware that a Bat, and especially one of the smallest species, would creep through a very small crack or crevice, yet the evidence of my own senses, after a very close examination, convinces me that not even the smallest crack existed between the bricks of the vault; and I think the evidence no less conclusive that the vault has remained untouched for a great number of years. Again, notwithstanding the disbelief of some, it is very generally acknowledged that Toads do occasionally exist in blocks of stone and in timber; and the material in which they are inclosed having gradually formed around them, they must necessarily have been entombed, in some well-authenticated cases, for a very long period of time. Why then, I ask, should we deny that to be possible with the Bat, which we so readily concede to be an occurrence by no means unusual with the Toad? I own, that, taking all these things into account, and finding no other possible solution for the mystery, I came to the conclusion, after mature deliberation,

that the Bat had been entombed in the vault since it last was opened in the year 1748. That impression has increased upon longer reflection, and has been further strengthened almost into certainty, from the perusal of a very interesting and very similar case, recorded by the Rev. J. P. Bartlett in an early volume of the *Zoologist* (*Zool.*, 613.)* That gentleman states, that on opening a vault which had been closed for twenty-one years, a Bat was discovered in a torpid state; that he himself made a very careful search about the vault, and was unable to discover any crack through which the smallest Bat could have crept; that the vault was surrounded with brickwork; the entrance was bricked up, and over the steps was placed a close-fitting slab; and that he could come to no other conclusion than that the Bat had been inclosed there for twenty-one years. I confess that I quite agree in opinion with Mr Bartlett, and believe that the Bat discovered in the vault in Bishopsbourne church crept in on the occasion of its last opening: and so in the like manner with the one found in my own church; for although there is unquestionably a vast difference between twenty-one and a hundred and six years, yet, if we can establish the fact of a Bat remaining torpid for the shorter period, I find no difficulty in understanding that a sleep which would endure so long as that did, might be protracted to a far longer period. It is most probable that many will differ from me in opinion, and perhaps some will ridicule the idea: if they can discover any other pro-

* See page 183, *ante*.

bable or even possible means of accounting for the presence of the Bat in the vault, exclusive of a crack or chink in it, or of its having been opened within the memory of living man, both of which views I firmly oppose, I shall feel greatly obliged by their stating their opinions in the *Zoologist:* meanwhile I hold to my belief, that the Bat had been there for not less than *one hundred and six years!*"*

* *Zool.*, 4245.

V.

HYBERNATION OF SWALLOWS.

WHAT becomes of our swallows in the winter? They migrate, you reply, to a warmer parallel. That is true, no doubt; though there have not been wanting naturalists of respectable name who have maintained that none of them ever leave the country. No doubt, however, they do migrate; but is this true of the entire body, or only of a portion? That the whole hirundinal population—swifts, swallows, martins, and bank-martins—disappear from view, every one knows; for who ever saw any of the tribe wheeling and traversing through the sky in the frosts of January or February? But so do the Bats and the Butterflies. Now, the Bats hybernate with us, concealing themselves in crevices, caves, hollow trees, unused buildings, and similar places; so do the house-flies; so do the butterflies, some species at least, and many other insects. Do the Swallows hybernate? That they do is a very old opinion; and those homely but wide-spread rhymes that record so many accepted facts in popular natural history, record *this* as a fact. Our rustic children sing—

> "The bat, the bee, the butterfly,
> The cuckoo and the swallow,
> The corn-crake and the wheat-ear,
> They all sleep in the hollow."

Local variations—what we may call *lectiones variæ*—exist; for example, in the south-east of our island, the third line runs,

"The corn-crake and the *nightingale.*"

In the north of Europe an opinion has long prevailed that the Swallows not only hybernate in a state of torpidity, but, like the frogs and toads, retire to the bottoms of pools to spend that dreary season. In Berger's "Calendar of Flora," published in the *Amœnitates Academicæ*, vol. iv., he puts down as the phenomenon proper to the 22d of September, "*Hirundo submergitur*," talking, as Gilbert White remarks, as familiarly of the Swallows going under water, as he would of his poultry going to roost at sunset. Klein, and even Linnæus himself, adopted this strange opinion, which was considered to rest upon good testimony, and that not only of the illiterate and unobservant. Etmuller, who was Professor of Anatomy and Botany at Leipsig in the middle of the seventeenth century, says, "I remember to have found more than a bushel would hold of Swallows closely clustered among the reeds of a fish-pond under the ice, all of them to appearance dead, but with the heart still pulsating." And Derham, the acute author of "Physico-theology," citing this statement, adds, "We had at a meeting of the Royal Society, February 12, 1713, a further confirmation of Swallows retiring under water in the winter from Dr Colas, a person very curious in these matters, who, speaking of their way of fishing in the northern parts by breaking holes and drawing their nets under the ice, saith, that he saw sixteen

Swallows so drawn out of the Lake of Lamrodt, and about thirty out of the king's great pond in Rosneilen; and that at Schlehitten, near a house of the Earl of Dohna, he saw two Swallows just come out of the waters, that could scarcely stand, being very wet and weak, with their wings hanging on the ground; and that he observed the Swallows to be often weak for some days after their appearance." *

The Academy of Upsal received the winter submersion of the Swallows as an undoubted fact, and even Cuvier admits as "well authenticated, that they fall into a lethargic state during winter, and even that they pass that season at the bottom of marshy waters." † One would think that a zoological statement which Linnæus and Cuvier accepted, must be fact; yet it remains utterly improbable. In Germany, a reward of an equal weight in silver was publicly offered to any one who should produce Swallows found under water, but we are assured that no one was found to claim the money.

We may safely dismiss the notion of submersion till better authenticated; but that of torpidity is still open to examination. Statements to the effect that quantities of Swallows in a death-like condition have been found in hollow trees, holes in cliffs, banks, &c., are even more common than those of their submersion; and they seem to obtain credence in all the temperate or cold regions where the Swallows are found. It is hard to think that a persuasion so widely diffused can be wholly groundless.

* *Phys. Theol.*, vii., Note *d*. † *Règne Anim.*, (Griffith's Ed.,) vii. 61.

Peter Collinson, the friend and correspondent of Linnæus, communicated to the Royal Society the following statement by M. Achard:—"In the latter end of March I took my passage down the Rhine to Rotterdam. A little below Basel, the south bank of the river was very high and steep, of a sandy soil, sixty or eighty feet above the water.

"I was surprised at seeing, near the top of the cliff, some boys tied to ropes, hanging down doing something. The singularity of these adventurous boys, and the business they so daringly attempted, made us stop our navigation, to inquire into the meaning of it. The waterman told us they were reaching the holes in the cliffs for Swallows or Martins, which took refuge in them, and remained there all the winter, until warm weather, and then they came abroad.

"The boys being let down by their comrades to the holes, put in a long rammer, with a screw at the end, such as is used to unload guns, and, twisting it about, drew out the birds. For a trifle I procured some of them. When I first had them, they seemed stiff and lifeless; I put one of them in my bosom, between my skin and shirt, and laid another on a board, the sun shining full and warm upon it; and one or two of my companions did the like. That in my bosom revived in about a quarter of an hour; feeling it move, I took it out to look at it; but perceiving it not sufficiently come to itself, I put it in again; in about another quarter, feeling it flutter pretty briskly, I took it out, and admired it. Being now perfectly re-

covered, before I was aware, it took its flight; the covering of the boat prevented me from seeing where it went. The bird on the board, though exposed to a full sun, yet, I presume from a chilliness of the air, did not revive so as to be able to fly." *

On this account I may observe that Collinson would hardly have been the medium of this communication, unless he had been satisfied of the probity of his correspondent. The time was "the latter end of March," a fortnight at least before the arrival of the Sand Martin—the earliest of our migrants; and the whole enterprise of the boys, and the familiarity of the waterman with the circumstance, as well as their assertions, shew that they, at least, had no doubt about this being a case of hybernation. Yet the repeated exploration of the Sand Martin's burrows in this country, in winter, has produced no birds.

White of Selborne, who was very much interested in the solution of this question, mentions two instances—both, however, on hearsay evidence. A clergyman assured him that, when he was a boy, some workmen, in pulling down the battlements of a tower, early in spring, found two or three Swifts *among the rubbish*, which appeared dead, but revived in the warmth. The other account was that of the fall of a portion of the cliff near Brighton in winter, when many persons found Swallows among the rubbish; but here even White's informant did not see the birds, but was merely told of them.†

Bishop Stanley, in his "Familiar History of Birds," has

* *Phil. Trans.*, 1763. † *Letter* x.

collected some stories which appear circumstantial enough, if we could be quite sure they were authentic; on which point the good bishop seems to give the weight of his own character, since he observes that they are "cases which have come to our knowledge, on the most respectable authority."

"On the 16th of November 1826, a gentleman residing near Loch Awe, in Scotland, having occasion to examine an out-house, used as a cart-shed, saw an unusual appearance upon one of the rafters which crossed and supported the thatched roof. Upon mounting a ladder, he found to his astonishment that this was a group of Chimney-swallows (*Hirundo rustica*) which had taken up their winter quarters in this exposed situation. The group consisted of five, completely torpid: and none of the tribe to which they belonged had been seen for five or six weeks previously: he took them in his hand, as they lay closely and coldly huddled together, and conveyed them to his house, in order to exhibit them as objects of curiosity to the other members of his family. For some time they remained to all appearance lifeless; but the temperature of the apartment into which they were carried being considerably raised by a good turf fire, they gradually evinced symptoms of reanimation; and in less than a quarter of an hour, finding that they were rather rudely handled, all of them recovered, so as to fly impatiently round the room, in search of some opening by which they might escape. The window was thrown up, and they soon found their way into the fields, and were never seen

again. A similar circumstance, though, from the place of its discovery it must refer probably to Sand Martins, was related by a gentleman who found two Swallows in a sand-bank at Newton, near Stirling, quite dormant.

"Again, about half-a-dozen Swallows were found a few years ago, in a torpid state, in the trunk of a hollow tree, by a countryman, who brought them to a respectable person, by whom they were deposited in a desk, where they remained forgotten till the following spring, when, one morning, on hearing a noise, he opened the desk, and found one of them fluttering about: the others also began to shew signs of life, and upon being placed out of doors in the sun, speedily arranged their plumage, took wing, and disappeared.

"On the 2d of November 1829, at Loch Ransa, in the island of Arran, a man, while digging in a place where a pond had been lately drained off, discovered two Swallows in a state of torpor; on placing them near the fire, they recovered. One unfortunately escaped, but the other was kept by the man, for the purpose of shewing it to some scientific persons."

In North America there is a curious species of Swift, (*Acanthylis pelasgia,*) which associates in immense flocks to roost in chimneys and hollow trees. It is the popular belief that these birds spend the winter in a torpid condition in their roosting trees. Williams, in his "History of Vermont," speaks of a large hollow elm which had been for many years appropriated to this purpose. A farmer resident close to the tree was persuaded that it was the

winter dwelling-place of the Swifts, and avoided felling it on that account. About the 1st of May, he always saw them come out of it in large numbers, about the middle of the day, and in a short time return. Then, as the weather grew warmer, they came forth in increased multitudes in the morning, and did not return till night. A similar account was given of another tree: the first appearance of the Swifts in spring was always their emergence from its hollow trunk, and their last, in September, was their ingress. Yet Wilson, the great ornithologist of America, argues, not without some heat, yet with considerable force, that such a belief is erroneous. Erroneous, certainly, the supposition that the whole body of the Chimney-swifts so hybernate; but whether a few do or do not, his arguments do not quite conclude.

The rustic quatrain, quoted in the outset of this disquisition, mentions the Corncrake, as associated with the Swallow in this winter-sleep,—"in the hollow." It is curious that two modern instances are on record of hybernating Corncrakes, though this is certainly as migratory a species with us as the *Hirundinidæ*. A farmer at Aikerness in Orkney, about midwinter, in demolishing a mud-wall, found a Corncrake in the midst of it. It was apparently lifeless; but being fresh to the feel and smell, it was placed in the warmth. In a short time it began to move, and in a few hours was able to walk about, and lived for two days in the kitchen; when refusing all food, or rather, none that suited it being then obtainable, it died.*

* Stanley's *Fam. Hist. of Birds*, p. 263.

"The second case occurred at Monaghan, in Ireland, where a gentleman, having directed his labourers, in winter, to remove a large heap of manure, that had remained undisturbed for a great length of time, perceived a hole, which was supposed to have been made by rats; it penetrated to a great depth, but at its termination, instead of rats, three Corncrakes were discovered, as if placed there with the greatest care, not a feather being out of its place, and apparently lifeless. The birds on examination were, however, considered to be in a torpid state, and were placed near a fire in a warm room. In the course of a short time a tremulous motion was observed in one of their legs, and soon after a similar motion was noticed in the legs and wings of the whole, which at length extended itself to their whole bodies, and finally the birds were enabled to run and fly about the room." *

Daines Barrington, the correspondent of Gilbert White and of Pennant, was a firm believer in the winter sleep of Swallows with us. He mentions, on the authority of Lord Belhaven, that numbers of Swallows had been found in old dry walls and in sandhills near his lordship's seat in East-Lothian; not once only, *but from year to year*, and that when they were exposed to the warmth, they revived. He says, however, he cannot determine the particular species.†

The same naturalist mentions many other instances in which they have been reported to be found, but he cannot give his personal voucher for the truth of the statements.

* *Edin. Journ.*, viii. † In Pennant's *Brit. Zool.*

"As first in a decayed hollow tree, that was cut down near Dolgelly, in Merionethshire; secondly, in a cliff near Whitby, in Yorkshire, where, in digging out a fox, whole bushels of Swallows were found in a torpid condition; thirdly, the Rev. Mr Conway, of Lychton, Flintshire, a few years ago, between All Saints' and Christmas, on looking down an old lead mine in that county, observed numbers of Swallows clinging to the timbers of the shaft, seemingly asleep, and on flinging some gravel on them they just moved, but never attempted to fly or to change their place." *

In some communications to the *Zoologist* for 1845, by the late Mr F. Holme, of Oxford, I find the following statement:—"On the hybernation of this species (the House-swallow) I was told many years since, by old Wall, then keeper of the Kildare Street Museum, in Dublin, ... that after a heavy snow, in the winter of 1825–26, on going into the *mansarde to* see whether the snow had melted through, he found four Chimney-swallows perched close together on a cross-beam, with their heads under their wings; but on approaching his hand to them they flew off, and escaped into the open air." †

Again, Mr J. B. Ellman of Battel, says, "There is a farmer named Waters, residing at Catsfield, (adjoining parish,) who informs me he has frequently (some years ago) dug Swallows out of banks in winter, while widening the ditches in the brooks," &c. ‡

* *Brit. Zool.*, App. † *Zool.*, 1136. ‡ Ibid., 2302.

It is unfortunate that most of these and similar discoveries were "some years ago;" and that, instead of increasing in frequency with the increase of scientific research and communication, they strangely become more rare. The same remark applies to the following statement: it is minute enough, and circumstantially precise; but, unfortunately, it was "fifteen years ago." The communicator is Edward Brown Fitton, Hastings, under date September 8, 1849:—

"A labourer named William Joyce, who is now employed in excavating part of the East Hill for the foundation of a house, told me yesterday, that, in the month of December, about fifteen years ago, while he was working for Mr William Ranger, who had the contract for cutting away the 'White Rock,' which used to stand between this place and St Leonard's, the men found an immense quantity of Swallows in a cleft of the rock. The birds were clinging together in large 'clots,' and appeared to be dead, but were not frozen together, the weather being rather warm for the season, nor were they at all putrid or decayed. The men carried out at least *three railway-barrows* full of birds, which were buried with the mould and rubbish from the cliff as it was wheeled away. Some people from the town carried away a few of the birds to 'make experiments with,' but Joyce never heard any more of them. He mentioned the names of four persons now in Hastings, who were then his fellow-labourers, and says, that forty or fifty of Mr Ranger's men were on the

spot when the birds were found, and can confirm what he says, both as to the finding and the very great quantity of the birds. There are many crevices in the seaward surface of the cliffs about here, which apparently penetrate the cliff for several yards. The birds were found about ten feet from the surface of the rock facing the sea, and not very high up." *

There is yet another class of facts to be adduced, which has an important bearing on the subject. At first sight, these facts appear less conclusive than the asserted discoveries of the birds, because less direct; but I am inclined to attach more value to them, because they are attested by so many and so unexceptionable witnesses. I mean the sight of Swallows at large in these islands during the winter months. Let us see some examples.

White of Selborne records several cases: thus, in 1773, twenty or thirty House-martins were playing in the air all day on the 3d of November,† after having disappeared from the 22d of October. In 1772, he saw three House-swallows gliding by on the sea-shore at Newhaven, on the 4th of November. ‡ On another occasion, (the year not being recorded,) he saw, on a sunny morning, a House-martin flying, at Oxford, on the 20th of November.§ On the 26th of November 1768, one of his neighbours saw a Martin hawking briskly after flies.‖ And a very respectable gentleman assured him that on a remarkably hot day, either in the last week in December or the first week

* *Zool.*, 2590. † *Letter* xxxviii. ‡ Ibid. xii.
§ Ibid. xi. ‖ Ibid. xxxi.

in January, he espied three or four Swallows in the moulding of a window of Merton College, Oxford.*

Colonel Montagu remarks that "there are a variety of instances of the Swallow and Martin having been seen flying in the months of November and December, roused probably from a state of torpidity by an unusual warmth of the air;"† and Captain H. W. Hadfield, commenting on this, affirms that he has "more than once had ocular proof of their presence during the winter months."‡ Yarrell gives examples of the late appearance of the Swift. One was seen by Mr Blackwall on the 20th of October 1815; a second in Perthshire on the 8th of November 1834; and a third in Devonshire, by the Rev. Mr Cornish, on the 27th November 1835.§ In considering these cases, it is needful to bear in mind that the Swift migrates from this country annually from the 1st to the 15th of August.

Mr C. R. Bree mentions the following case, which I record, not because it was particularly late, but because the state of the season, and some other circumstances which he remarks on are interesting:—"On the 25th of October 1848, some workmen being engaged on the roof of my house, I was surprised by the appearance of three Swallows flying about the men. I had not seen one since the beginning of the month. By the side of the edge of the gable-end of the house the plaster was broken away, forming a hole, which led under the roof. While watch-

* *Letter* xxiii.
† *Orn. Dict.*, Introd., xxvii.
‡ *Zool.*, 5364.
§ *Brit. Birds*, ii. 264.

ing the birds, which came occasionally quite close to my face, I saw first one, then another, alight upon the ledge of the gable-end, near the hole. Now, I thought, I am to settle the question of hybernation: but I was disappointed. Though I watched them for several hours—though I sent the workmen to another part of the house, yet, although they frequently settled about the hole, they never entered it. They were evidently young birds, and had been disturbed. One of them rested upon the chimney, and appeared weak and dull. I lost sight of them during the day; but the following morning, the weather being warm, I saw several flying about high up in the air. There is some mystery about these things. Why have these late appearances been more remarked this year than other years? How did the birds obtain food during the three weeks of bitter cold weather when they were not seen in October?" *

On the 10th of December 1843, a specimen of the Swallow, *an adult bird, not a young of the season,* (an important circumstance,) in full plumage and good condition, was shot at Goole, in the West Riding, and was sent to Mr R. J. Bell, of Derby, a good ornithologist,† who records the fact. In 1852, that excellent naturalist, Mr Hewitson, of Oatlands, saw two Chimney-swallows at Eshar on the 18th of November, and on the 21st had four martins about his house.‡ In 1855, Mr E. Vernon Harcourt reports the occurrence of several Martins skimming about

* *Zool.*, 2455. † Ibid., 565. ‡ Ibid., 3753.

at Uckfield on the 23d of November; and on the 6th of December several Chimney-swallows about the house at Hastings.* In the same season flocks of Martins were hawking vigorously, in the vicinity of Penzance, to the 28th of November, as witnessed by Mr E. H. Rodd.† Captain Hadfield again, writing in 1856, gives extracts from his journals, whereby he records having seen Swallows and Martins as late as November 3, 1841, December 2, 1842, November 13, 1852, November 22, 1853, November (about the middle) 1854, and November 24 (Swallows) and December 2 (Martins) 1855. Of the last-mentioned occurrence he gives the following interesting note:—"Dec. 2, 4 P.M. Observed eight Martins flying round the garden, and occasionally alighting on the perpendicular face of the wall of a house near my garden gate, to which they would cling for a few seconds, and then, dropping off, whirl round, returning to the same spot, seemingly quite unconscious of my presence and that of several others: they seemed bent on effecting an entrance under the eaves of the house, by a small opening they had discovered near a water-pipe that had been carried through the wall: they were, I believe, all young birds of the season, as they appeared small, their tails being also shorter than in the adults; they were weak on the wing, but that may have arisen from their being benumbed by the cold, the thermometer standing at 44° only at the above hour. There had been a bright sun during the greater part of

* *Zool.*, 4945. † Ibid., 4945.

the day, but I had observed a white frost in the morning. I conclude that these late birds were merely seeking a roosting-place for the night, and not a place of concealment for the winter, although I might have been excused, according to Cuvier, White, &c., had I thought they were taking up their winter quarters; but I have not sufficient faith in the theory to induce me to unslate a part of the roof to seek for them, which might be done, however, at a trifling cost, provided permission were obtained." *

It is rather a pity that the observer had not confidence enough to induce him to make the investigation which he suggests.

Mr William Bree mentions as many as fifteen or twenty Martins and Swallows sporting in the air near Temple Balsall on the 18th November 1846, adding that he has frequently seen individuals much later, but never recollects to have seen so great a number together at that late period. And, finally, Mr J. Johnston, jun., reports that he saw, in the afternoon of 18th January 1837, three Swallows dipping and hawking as in summer, near Wakefield.†

There is less evidence of the appearance of these birds before the ordinary time of arrival of the migrants. But White, when a boy, observed a Swallow for a whole day together on a sunny warm Shrove Tuesday, which day could not fall out later than the middle of March, and often happened early in February.‡ And Mr Samuel Gurney, jun., together with several other persons, saw

* *Zool.*, 4995. † Ibid. 1639. ‡ *Letter* xviii., 2d ser.

either a Martin or Swallow, on the 27th of March 1844.*

If this last occurrence had stood alone, it would have been of slight importance; for Yarrell mentions a single Swallow as having been seen by a fisherman near the Eddystone as early as the 4th of April; and Sand-martins, even as far north as Carlisle, before the end of March. It is just possible that these may have been stragglers of the great army of migrants, arriving some ten or fifteen days before their time; but considering the whole great array of evidence, I rather believe that these too were hybernants, who had been prematurely awakened from torpidity by unusually warm days.

The accounts of *Hirundines* having been found in a somnolent state in winter may or may not be true; though the great number of such statements in various and distant countries makes the indiscriminate rejection of them even more difficult than the acceptance. But still there remains the undeniable fact that it is quite an ordinary thing for birds of this family, including all our four common species, to be seen with us through November and December, and occasionally in January;—that is, for two or three months after the great body of migrants have left the country. No one, I suppose, pretends that migration of Swallows takes place in December or January; therefore it is manifest that a certain number—more or fewer—remain. What becomes of them? We certainly

* *Zool.*, 565.

see them only occasionally: where are they on the days on which they do not appear,—days extending to several consecutive weeks? If they had not been torpid during those weeks, if the more active functions of life had not been suspended, would they not certainly have been starved? But the specimen shot on the 10th December, and examined by Mr Bell, was in good condition, which is consistent with but one alternative; either it had been well fed throughout the preceding six weeks, or it had been hybernating. But the former supposition implies that it had been habitually on the wing during that period, as Swallows feed only on the wing; which could not have been the case without its being noticed and recorded.

It is common to say that these occasional winter Swallows are the later broods of young, which, being too infantile to migrate, are compelled to linger in the country of their nativity, and becoming lethargic from the advancing cold, at length die before the spring. But when this hypothesis is looked at, it seems hardly tenable. In many of the instances recorded, the specimens seen even late into the winter, are represented as gaily and vigorously hawking for flies, or sweeping over the water as in summer. This does not look like poor deserted orphans starved with the cold, retiring to die; but birds in health, temporarily awakened from normal slumber by an unusual temperature, and instantly ready for a full use of their faculties. However, to settle the point by fact, Mr Bell

distinctly states that his specimen of December 10th was "an adult bird, *not* a young bird of the season."

If it should be asked why they do not appear in January or February, as well as November and December, the answer is obvious. The winter's lethargy of hybernating warm-blooded vertebrates is much more readily interrupted in the earlier part of the season than in the middle and latter part. And this is natural; for the more intense cold of January benumbs and suspends the vital functions far more completely, and the *coma* so superinduced is sufficiently deep to resist the counteracting influence of a few warm days, even though the temperature should be as high as on those earlier days that awakened them, or even higher.

The aggregate evidence, then, seems to leave no room for reasonable doubt, that a certain number of our *Hirundinidæ*,—few, indeed, as compared with the vast migrant population, but still considerable, looked at *per se*,—for some reason or other, evade the task of a southward flight, and remain, becoming torpid, occasionally betrayed into a temporary activity, and resuming their active life, about the same time, or occasionally a little *before* the time, of the arrival of their congeners from abroad. It is, however, desirable for the absolute settlement of the question, that specimens, actually discovered in a lethargic condition, should come under the observation of competent scientific naturalists, *open to conviction*, who would leave them *in situ*, keeping an eye on them from time to time till the return of warm

weather in spring. It is not enough to take them into a warm room, and to shew that they revive in such circumstances: we want to know positively whether they will be resuscitated normally and naturally by the vernal warmth, and come forth spontaneously to sport, and wheel, and skim, and soar, and stoop, and hawk, and twitter,—among their travelled fellows. Who will undertake to decide the point in this manner? He will have achieved a name in science.

VI.

THE CRESTED AND WATTLED SNAKE.

About the middle of the last century there existed in Amsterdam a Museum of natural history, which, though accumulated by the zeal and industry of a private individual, far exceeded in extent and magnificence any collection then in the world. It had been gathered by Albert Seba, a wealthy apothecary in the Dutch East India Company's service, who fortunately published an elaborate description of its contents. This great work, "*Locupletissimi Rerum Naturalium Thesauri accurata Descriptio,*"—in four volumes folio, published from 1734 to 1765,—is even now remarkable for the accuracy and beauty of its copious engravings, which still are referred to as authorities, though the descriptions are devoid of scientific value. Many of these figures and descriptions, about whose reality no shadow of doubt exists, are those of creatures which are altogether unknown to modern science, and some of them are highly curious.

Serpents seem to have been a special hobby of Seba's; and he has delineated a vast number of species. Among them are two* about which a singular interest hangs. They are of rather small size; the one pale yellow, marked

* *Op. cit.*; vol. ii. pl. 40.

with oval reddish spots, the other reddish, with five green transverse bands. The head in each case has a horny-pointed muzzle, and the cheeks are furnished with depending wattles of a coral-red hue.

From the expressions of wonder with which Seba introduces his descriptions of these animals, it is evident that they were no ordinary forms. He does not know whether to call them Eels or Serpents, the critical characters, which in our day would instantly determine this point, being then scarcely heeded. He calls them "marine," but whether on any other evidence than the pendent processes of the cheeks, which he calls "fins," does not appear. But no fish known to naturalists will answer to these representations. The pointed head, indeed, resembles in some respects that of *Muræna*, but this genus of fishes is altogether destitute of pectoral fins, while the vertically-flattened tail, and the long dorsal and anal fins confluent around the extremity of the body in *Muræna*, are totally unlike these figures. These and all similar fishes are, moreover, destitute of visible scales; but in these the scaling is decidedly serpentine, and the second, in particular, has large symmetrical plates across the belly, while the head in both is shielded with broad plates like a Colubrine Snake. The tail is drawn out to a long conical point, without the slightest appearance of compression or of bordering fins. In one figure there is seen a little projecting point at the edge of the lower belly, which at first sight suggests the idea of the anal hook of a *Boa*, but which, by comparison with other

figures, we discover to be intended to represent the projection of the pre-anal scale. The very minuteness of this character makes it valuable: its value was doubtless unheeded by the artist, who merely drew what he saw; it is, however, a very decisive mark of distinction between a serpent and a fish.

Seba records that he had received these Serpents from the Island of St Domingo. This was at that time a flourishing French colony, and its natural productions were far better known to Europe than they now are. When I visited the neighbouring island of Jamaica in 1845–46, I heard accounts of a wonderful animal occasionally seen in the eastern districts of the island, which was reported as a Snake with a cock's comb and wattles, and which crowed like a cock. A good deal of mystery attached to this strange Serpent.

It was appropriated to a very remarkable and peculiar character of scenery:—A wild mountain-region, formed of white limestone, abounding in narrow glens, bounded by abrupt precipices, and permeated by whispering streams that frequently pour in slender cascades over the rocks. The limestone rock rises in abrupt terraces, wall above wall, and its entire surface is most singularly honeycombed, "as if wrought by a graving tool into rough diamond-points," alternating with smooth and rounded holes of various sizes, from that of a hazel-nut upward. In many of these hollows lie the small land-shells of the country, bleached perfectly white, like the stone itself, of the genera *Helix*, *Cyclostoma*, *Helicina*, *Cylindrella*,

Achatina, &c., many of them perfect, but many more in fragments. They exactly resemble fossil shells *in situ*, but the species are absolutely identical with those that crawl over the shrubs and trees in the same region. In very many cases the dead shells accurately fit the hollows in the rock, whose interior is impressed with the form and sculpturing of the shell in *intaglio* :—a most curious and interesting fact, as it points to the very recent formation of the region, the stone bearing evident tokens of having been in a plastic condition when the shells were enveloped in it. Out of the hollows of the rock, their roots fast grasping the sharp-edged projections and tooth-like points of stone, and twining through the tortuous cavities, and insinuating their fibrils into every minute hollow where water may lodge, grow many tall trees of various kinds, interlaced with climbers, and hung with festoons of *lianes*, that resemble long and twisted cords, thrown from one to another, or depending from the branches towards the ground. The noble Agave, or what we in England call the American Aloe, here throws out its broad, fleshy, spine-edged leaves, and lifts its tall flower-stalk loaded with the candelabra-like branches of bloom; and numerous thick *Cacti*, some erect and massive, others whip-like, long and trailing, give a peculiar aspect to the vegetation. Great tufts of *Orchideæ*,—the lovely *Broughtonia*, with its thick ovate leaves, and racemes of elegant crimson flowers, the *Brasavola*, with long leaves resembling porcupine-quills in form, and blossoms of virgin white, the *Oncidium*, with its yellow and red flowers, like

a score of painted butterflies dancing in every breath, and many others,—crowd the forks or droop from the twisted boughs of the trees.

This formation of honeycombed limestone is full of caverns, many of which lead into one another in chains, and which have invested the region with a sort of superstitious mystery. Runaway slaves and outlaws have availed themselves of the facilities which its ravines and inaccessible fastnesses afford, to defy capture; and during the rebellion of the Maroons, it attained a considerable notoriety. There is one estate about eight miles from Kingston, in the immediate vicinity of which the famous hero, Three-fingered Jack, made his head-quarters. It is a district of wild torrents and waterfalls of the most romantic character; "the imagination of no painter of theatrical spectacles can surpass the wild wonders of the mountain-hold of the *real* Three-fingered Jack. Part of the road by which you ascend the falls is a subterranean passage; and caverns are entered by simple crevices which seem mere chinks in the irregular surface of the rock, all which natural peculiarities account for the mysterious disappearances which the mountain hero was enabled to enact from his pursuers."

It was at this spot I first heard reliable tidings of the strange Crested Snake. A medical gentleman of reputation informed me that he had seen, in 1829, a serpent of about four feet in length, but of unwonted thickness, dull ochry in colour with well-defined dark spots, having on its head a sort of pyramidal helmet, somewhat lobed at

the summit, of a pale red hue. The animal, however, was dead, and decomposition was already setting in. He informed me that the negroes of the district were well acquainted with it; and that they represented it as making a noise, not unlike the crowing of a cock, and as being addicted to preying on poultry.

Nor is it in Jamaica alone that the Crested Snake is known. In the island of St Domingo, whence Seba received his curious specimens, my friend Mr Hill heard reports of it. A Spanish gentleman whom he was visiting in Hayti, told him that he had seen it, and begged him to note it among the remarkable things of the country. It was in that far east of the island, known as the ancient Caciquedom of Higuey, where the Indians were of a more warlike disposition than their meek brethren of the centre and west, and where the cruelties perpetrated upon them by their Spanish invaders reached such a superhuman pitch of diabolism, that even Las Casas says he almost feared to repeat them. The limestone mountains are here of exactly the same description as those in Jamaica, and the scenery assumes exactly the same romantic character. My friend's Spanish informant had seen the serpent with mandibles like a bird, with a cock's crest, with scarlet lobes or wattles; and he described its habits,—perhaps rather from common fame than from personal observation,—as a frequenter of hen-roosts, into which it would thrust its head, and deceive the young chickens by its imitative physiognomy, and by its attempts to crow, like their own Chanticleer.

"Il canta como un Gallo;" was the report in Hayti, just as in Jamaica.

I was much interested in this mysterious reptile, and mentioned in the public papers my wish to possess a specimen. A gentleman of the vicinity, Mr Jasper Cargill, was so desirous to oblige me that he offered a sovereign for one; but though several persons were prompt to promise the capture, no example was forthcoming.

After my return from Jamaica, the occurrence of two specimens found came under the notice of my friend, but neither of them was preserved. Mr Cargill had informed him that some years before, when visiting Skibo, in St George's, an estate of his father's, in descending the mountain-road, his attention was drawn to a snake of a dark hue, that erected itself from amid some fragments of limestone-rock that lay about. It was about *four feet long*, and unusually *thick-bodied*. His surprise was greatly increased on perceiving that it was *crested*, and that from the side of the cheeks depended some *red-coloured flaps*, like gills or wattles. After gazing at him intently some time, with its head well erect, it drew itself in, and disappeared among the fragmentary rocks.

The son of this gentleman met with another specimen under the following circumstances, as detailed to me by my friend:—"It was, I think, on Easter Eve, the 30th of March last, [1850,] that some youngsters of the town came running to tell me of a curious snake, unlike any snake they had ever seen before, which young Cargill had shot, when out for a day's sport among the woodlands of

a neighbouring penn. They described it as in all respects a serpent, but with a very curious shaped head, and with wattles on each side of its jaws. After taking it in hand and looking at it, they placed it in a hollow tree, intending to return for it when they should be coming home, but they had strolled from the place so far that it was inconvenient to retrace their steps when wearied with rambling; but they had lost no time in relating the adventure to me, knowing it would interest me much, particularly as young Cargill's father had thought it a snake similar to the one he had seen at Skibo, in St George's, or to the crested serpent for a specimen of which, when in St Thomas's in the East, he had offered the sum of twenty shillings. The youth that shot the snake fell ill on the following morning with fever, and could not go back to the woodlands to seek it, but he sent his younger brother who had been with him; but although he thought he rediscovered the tree in which his brother had placed it, he could not find the snake. He conjectured that the rats had devoured it in the night. When this adventure was related to me, another youth, Ulick Ramsay, a godson of mine, who came with the young Cargills to tell me of their discovery, informed me that not long previously, he had seen in the hand of the barrack-master-serjeant at the barracks in Spanish Town, a curious snake, which he, too, had shot among the rocks of a little line of eminences near the railway, about two miles out, called Craigallechie. It was a serpent with a curious shaped head, and projections on each side, which he likened to the fins of an eel,

but said they were close up to the jaws. Here are, unquestionably, two of the same snakes with those of Seba's Thesaurus, taken near Spanish Town, and both about the honeycombed rocks that protrude through the plain of St Catherine's in detached ridges and cones and hummocks, being points of the greater lines of limestone, which have been covered by the detritus of the plains, leaving masses of the under-rocks here and there uncovered. These are the spots frequented, too, by the *Cyclura;* and are continuations of our Red Hills—a country that so much resembles the terraced cliffs and red-soil glens of Higuey.

It is remarkable that I have heard nothing more of this serpent of renown, this true Basilisk, from that time till now; though I have no doubt my Jamaica friends, who had become much interested in the matter, would have communicated the specimen to me if any one had been obtained. There is, however, sufficient evidence to assume the existence of such a form in the greater Antilles, whether Seba's figures be identical with it or not.

VII.

THE DOUBTFUL.

A VERY curious and unaccountable habit is attributed to some Reptiles, which, though asserted by many witnesses, at different times and in distant countries, has not yet received the general assent of men of science. White of Selborne, in one of his charming letters to Pennant, has the following note:—"Several intelligent folks assure me that they have seen the Viper open her mouth and admit her helpless young down her throat on sudden surprises, just as the female Opossum does her brood into the pouch under her belly, upon the like emergencies. Yet the London viper-catchers insist on it, to Mr Barrington, that no such thing ever happens."*

The evidence of the London viper-catchers goes for no more than it is worth; those whom Mr Barrington applied to,—how many and of what experience I know not,—had not met with such a case. But negative evidence is of little weight against positive. At the same time, others of the same fraternity affirm the fact. There is, as Mr Martin observes, no physiological reason against the possibility of the young maintaining life for a brief period within the stomach of the parent. A swallowed frog has

* *Brit. Rept.*, 51.

been heard, by Mr Bell, to cry several minutes after it had been swallowed by a snake; and the same excellent authority has seen another frog leap out of the mouth of a snake which had swallowed it, taking advantage of the fact that the latter gaped, as they frequently do, immediately after taking food.

Mr Martin says he has conversed with several who had been assured by gamekeepers and gardeners that the swallowing of the young by vipers had been witnessed by them.* And Mr Blyth, a zoologist of established reputation, observes,—"I have been informed of this by so many credible eye-witnesses, that I cannot hesitate in yielding implicit credence to the fact. One man particularly, on whose word I fully rely, tells me that he has himself seen as many as thirteen young vipers thus enter the mouth of the parent, which he afterwards killed and opened for the purpose of counting them."†

Mr E. Percival, writing to the *Zoologist*, under date "64 Lincoln's-Inn-Fields, Oct. 17, 1848," narrates the following facts:—"When in Scotland, last autumn, I saw what at the time satisfied me that vipers really possessed this faculty, though the evidence was scarcely as conclusive as might have been wished. Walking along a sunny road, I saw a viper lying on the parapet. She had apparently just been killed by a blow from a stick. Five or six young ones, about four inches long, were wriggling about their murdered parent, and one was making its way

* *Penny Cyclop.*, xxvi. 348.

† Loudon's *Mag. Nat. Hist.* for 1837, p. 441.

out of her mouth at the time when I approached. Whether this was the first time the young ones had seen the light, or whether they were only leaving a place of temporary refuge, I leave to more experienced observers than myself to determine."*

This communication brought out the following from the late Mr John Wolley:—"Mr Percival's interesting note (*Zool.*, 2305) on this subject reminds me of a very similar anecdote, told me several years ago by a gentleman who is an accurate observer, and who has had long experience in all kinds of sports. He one day shot a viper, and almost immediately afterwards it was surrounded by young ones, in what appeared to him the most mysterious manner. But here the grand link was wanting which Mr Percival has supplied,—the young ones were not seen to come out of their mother's mouth. I may be allowed to mention an anecdote, told me in 1842, by an illiterate shepherd of Hougham, near Dover: he met me catching vipers, and, on my entering into conversation with him, he volunteered—without any allusion of mine—to tell this curious story. One day his father came suddenly upon a viper surrounded by her young, she opened her mouth and they all ran down her throat; he killed her, and leaving her on the ground, propped her mouth open between two pieces of stick; presently the young ones crawled out: on the slightest alarm they retreated back again,—and this they did repeatedly for several days, during which time many people came to see it.† The young which White

* *Zool.*, 2305. † Ibid., 2355.

of Selborne cut out of the old female, and which immediately threw themselves into attitudes of defiance, had probably not then seen the daylight for the first time. Mr Bell, in a note in Bennett's edition of White's 'Selborne,' mentions the wide-spread belief in this alleged habit of the viper; but appears to consider the fact not proved. Accounts of similar habits in foreign viviparous snakes, common report, and, above all, Mr Percival's observation, leave no doubt on my mind about the matter."

The most recent case on record that I have met with, is the following, communicated to the *Zoologist** for last December, by the Rev. Henry Bond, of South Petherton:—

"Walking in an orchard near Tyneham House, in Dorsetshire, I came upon an old adder basking in the sun, with her young around her; she was lying on some grass that had been long cut, and had become smooth and bleached by exposure to the weather. Alarmed by my approach, I distinctly saw the young ones run down their mother's throat. At that time I had never heard of the controversy respecting the fact, otherwise I should have been more anxious to have killed the adder, to prove the case. As it was, she escaped while I was more interested in the circumstance I witnessed than in her destruction."

Exactly the same thing is told of the North American Rattlesnake. Hunter says, that when alarmed, the young ones, which are eight or ten in number, retreat into the

* *Zool.*, 7278.

mouth of the parent, and reappear on its giving a contractile muscular token that the danger is past.*

M. Palisot de Beauvois asserts that he saw a large rattlesnake which he had disturbed in his walks immediately coil itself up and open its jaws, when in an instant five small ones that were lying by it rushed into its open mouth. He concealed himself, and watched the snake, and in a quarter of an hour saw her discharge them. He then approached a second time, when the young ones rushed into the parent's mouth more quickly than before, and the animal immediately moved off, and escaped. The phenomenon is said to have been observed in regard to some of the venomous snakes of India, but I cannot now refer to details.

Confirmation of a reported fact is sometimes derived from collateral evidence, and such is not wanting in the present case. The phenomenon is not confined to serpents; it has been observed in their near relatives, the lizards. Mr Edward Newman, while guarding the subject with a philosophical caveat, furnishes his readers with the following highly interesting and germane statement:— "1st, My late lamented friend, William Christy, jun., found a fine specimen of the common scaly lizard with two young ones. Taking an interest in everything relating to Natural History, he put them into a small pocket vasculum to bring home; but when he next opened the vasculum the young ones had disappeared, and the belly of the parent was greatly distended; he concluded she had devoured her own

* *Captivity among the Indians.*

offspring; at night the vasculum was laid on a table, and the lizard was therefore at rest: in the morning the young ones had reappeared, and the mother was as lean as at first. 2d, Mr Henry Doubleday, of Epping, supplies the following information:—A person whose name is English, a good observer, and one, as it were, brought up in Natural History, under Mr Doubleday's tuition, once happened to set his foot on a lizard in the forest, and while the lizard was thus held down by his foot, he distinctly saw three young ones run out of her mouth. Struck by such a phenomenon, he killed and opened the old one, and found two other young ones in her stomach, which had been injured when he trod upon her. In both these instances the narrators are of that class who do know what to observe, and how to observe it; and the facts, whatever explanation they may admit, are not to be dismissed as the result of imagination or mistaken observation."*

It is remarkable that all the serpents to which the phenomenon is attributed are ovo-viviparous. Our common lizard, to which the facts just narrated doubtless belong (*Zootoca vivipara*), has the same property, which, however, appears to be by no means common among the Saurian races. This coincidence, while it would afford a handle to the deniers of the stated facts, in the assumption that the emergence of the living young from the abdomen, or their presence within it, has given rise to the notion—may have an essential significance and connexion with the phenomenon itself, on the hypothesis of its truth.

* *Zool.*, 2269.

That endowment, whatever it be, which enables the young to live and breathe in the abdominal cavity of the mother before birth, may render it easier for them than for others not so endowed to survive a temporary incarceration within the stomach after birth. Mr Newman does not know how to believe that a young and tender animal can remain in the strongly digestive stomach of a viper and receive no injury; but he has forgotten to take into the account the well-ascertained power that living tissues have the power of resisting the action of chemical re-agents that would instantly take effect upon them when dead. The walls of the stomach itself are not corroded by the gastric-juice which is rapidly dissolving the piece of meat within it. If the young animals can do without air for a while in their snug retreat, I do not think they would need fear the digestive operation. Air, I should suppose, *must* be excluded from the stomach, unless the parent have the power of swallowing air voluntarily, for the emergency; but perhaps a cold-blooded animal like a reptile, with a sluggish circulation and respiration, might do with very much less fresh air than a mammal under similar conditions.

The proposed *rationale* of those who reject these statements,—that female vipers in the last stage of pregnancy have been opened, and have given freedom to living and active young, and that careless and unscientific observers have leaped to the conclusion that their young must have entered by the mouth,—will not stand before the testimony distinctly given by witnesses, who have actually seen the young retreat into the mouth, and have then found

them within the body. No doubt the subject needs further investigation by careful and unprejudiced naturalists; but the positive evidence already adduced on the testimony of so many deponents, warrants our accepting the phenomenon as a normal habit of certain species of Saurians and Ophidians, though it may be somewhat rarely resorted to, and that whatever physical difficulties may seem to stand in the way of its *à priori* probability—difficulties which perhaps depend on our ignorance, and which will disappear before the light of advancing knowledge.

The entomologists have fallen most ungallantly foul of Madame Merian, a lady who resided in Surinam nearly two hundred years ago, and devoted her attention to the native entomology, painting insects in a very admirable manner. She is set down as a thorough heretic, not at all to be believed, a manufacturer of unsound natural history, an inventor of false facts in science.

Among other things, she speaks of a large hemipterous fly, which has in consequence of her reports been named *Fulgora lanternaria*. This insect has the head produced into a large inflated proboscis more than an inch in length, which is said to carry an intense luminosity within its transparent walls, as a candle is carried within a lantern. The fair observer says that the first discovery which she made of this property caused her no small alarm. The Indians had brought her several of these insects, which by daylight exhibited no extraordinary appearance, and

she enclosed them in a box until she should have an opportunity of drawing them, placing it upon a table in her lodging-room. In the middle of the night the confined insects made such a noise as to awake her, and she opened the box, the inside of which, to her great astonishment, appeared all in a blaze; and in her fright letting it fall, she was not less surprised to see each of the insects apparently on fire. She soon, however, divined the cause of this unexpected phenomenon, and re-enclosed her brilliant guests in their place of confinement. She adds that the light of one of these Fulgoræ is sufficiently bright to read a newspaper by: and though the tale of her having drawn one of these insects by its own light is without foundation, she doubtless might have done so if she had chosen.

This circumstantial and apparently truthful statement has brought no small odium on the fair narrator. Other naturalists who have had opportunities of seeing the insect in its native regions strongly deny its luminosity. The inhabitants of Cayenne, according to the French Dictionnaire d'Histoire Naturelle, aver that it does not shine at all; and this is confirmed by M. Richard, a naturalist, who reared the species. The learned and accurate Count Hoffmansegg states that his insect-collector Herr Sieber, a practised entomologist of thirty years' experience, who during a sojourn of several years in Brazil took many specimens of the *Fulgora lanternaria*, never saw a single one which was in the slightest degree luminous. There is a kindred species in China, *F. candelaria*, very common in

those glazed boxes of insects which the Chinese sell to mariners; this also has been supposed to emit light, but Dr Cantor assures us that he has never observed the least luminosity in this species.

Thus it would seem that the obloquy which has fallen upon the ingenious lady is not altogether undeserved, and that for the sake of a telling story, she has been indeed "telling a story." But we may imagine her offended ghost looking round and saying, "All these gentlemen merely say they have *not* seen the light; now I say I have: is there no one who will verify my statement?"

M. Lacordaire,—an authority on South American insects second to none, says that he himself indeed never saw a luminous *Fulgora* all the time he was collecting in Brazil and Cayenne, and that most of the inhabitants of the latter country, when questioned on the subject, denied the fact, yet *that others of the natives as distinctly affirmed that it is luminous.* He asks whether it is not possible that the light may be confined to one sex, and thus the conflicting testimony be reconciled; and gives it as his opinion that the point is rather one which requires more careful observation, than one which we can consider absolutely decided.*

Again, the Marquis Spinola, in an elaborate paper on this tribe, published in the Annals of the Entomological Society of France,† strenuously contends that the remarkable development of the frontal portion of the head in the whole race is luminous. And finally, a friend of

* *Introd. à l'Entom.*, ii. 143. † *Op. cit.*, viii. 163.

Mr Wesmael assured him that he had himself seen the American *Fulgora* luminous while alive.*

It may help to sustain our faith in the veracity of Madame Merian, to know that there is some reason for attributing occasional luminosity to well-known English insects, of which hundreds, and even thousands, have been taken without manifesting a trace of the phenomenon. Mr Spence, in his interesting Letter on Luminous Insects,† adduces the following evidence :—Insects "may be luminous which have not hitherto been suspected of being so. This seems proved by the following fact: A learned friend has informed me, that when he was curate of Ickleton, Cambridgeshire, in 1780, a farmer of that place, of the name of Simpringham, brought to him a mole-cricket (*Gryllotalpa vulgaris*, Latr.), and told him that one of his people seeing a *Jack-o'-lantern*, pursued it, and knocked it down, when it proved to be this insect, and the identical specimen shewn to him.

"This singular fact, while it renders it probable that some insects are luminous which no one has imagined to be so, seems to afford a clue to the, at least, partial explanation of the very obscure subject of *ignes fatui*, and to shew that there is considerable ground for the opinion long ago maintained by Ray and Willughby, that the majority of these supposed meteors are no other than luminous insects. That the large varying lambent flames mentioned by Beccaria to be very common in some parts

* *Westwood's Mod. Classif. Ins.*, ii. 430.

† *Introd. to Entom.* Lett. xxv.

of Italy, and the luminous globes seen by Dr Shaw cannot be thus explained, is obvious. These were probably electrical phenomena; certainly not explosions of phosphuretted hydrogen, as has been suggested by some, which must necessarily have been momentary. But that the *ignis fatuus* mentioned by Derham as having been seen by himself, and which he describes as flitting about a thistle, was, though he seems of a different opinion, no other than some luminous insect, I have little doubt. Mr Sheppard informs me that, travelling one night between Stamford and Grantham on the top of the stage, he observed for more than ten minutes a very large *ignis fatuus* in the low marshy grounds, which had every appearance of being an insect. The wind was very high: consequently, had it been a vapour it must have been carried forward in a direct line; but this was not the case. It had the same motion as a *Tipula*, flying upwards and downwards, backwards and forwards, sometimes appearing as settled, and sometimes as hovering in the air. Whatever be the true nature of these meteors, of which so much is said and so little known, it is singular how few modern instances of their having been observed are on record. Dr Darwin declares, that though in the course of a long life he had been out in the night, and in the places where they are said to appear, times without number, he had never seen anything of the kind; and from the silence of other philosophers of our own times, it should seem that their experience is similar."

A paper by Mr R. Chambers on the subject adduces the

additional testimony of facts observed by good naturalists, as Dickson and Curtis the eminent botanists, and Stothard the painter and entomologist, by his own father Mr A. Chambers, and by Joseph Simpson, a fisherman living near Boston, all of which strongly corroborate the probability that some, at least, of the *ignes fatui* are produced by luminous insects.* Mr Main narrates the case of a farmer who stated that he had pursued a Will-o'-the wisp, and coming up with it had knocked it down, when it proved to be an insect "exactly like a Maggy-long-legs"—that is, the common Crane-fly (*Tipula oleracea*), the very insect with which Mr Sheppard had compared the motions of the luminous flame observed by him.† Mr Spence argues that while gaseous emanations may be a cause of stationary *ignes fatui*, the same cause will not explain those which flit along from place to place; and that these are probably luminous insects, however rarely they may have come under the notice of entomologists. "A very strong argument for the possibility of some flying insects being occasionally luminous (in England) is afforded by the facts . . . . of luminous caterpillars having been within these few years observed for the first time since entomology has been attended to, and that by observers every way competent. If caterpillars so very common as those of *Mamestra oleracea* may sometimes, though so rarely, be luminous, and if, as Dr Boisduval suggests, and is very probable, this appearance was caused by disease, it is obvious that flying insects may be also

* *Mag. Nat. Hist.*, New Ser., i. 353. † Ibid., i. 553.

occasionally (though seldom) luminous from disease—a supposition which will at once explain the rarity of the occurrence, and the circumstance that insects of such different genera, and even orders, are said to have exhibited this phenomenon."*

These highly curious facts should make observers cautious in strongly denying statements made by others of phenomena, when they themselves have not been so fortunate as to witness them, even though they may think their opportunities to have been as favourable as those of the *soi-disant* observer.†

But we have not yet dismissed Madame Merian. If acquitted of falsehood here, she stands arraigned on a second charge of similar character.

In most tropical countries there are found hideous hairy spiders of monstrous size and most repulsive appearance; short-legged, sombre-hued, ferocious marauders of the night, that by day lurk in obscure retreats under stones, or in burrows in the earth.

Guiana produces a formidable species of this sort (*Mygale avicularia*), which measures three inches in length, and whose feet—though the genus is, as I have said, comparatively short-limbed—cover an area some

* Dr Boisduval, one hot evening in June, found caterpillars on grass which diffused a phosphorescent light; he thought them to be those of *Mamestra oleracea*—one of the most abundant of our moths—but they seemed larger than common; and whether owing to want of care in the rearing or to a condition of disease—which may, indeed, have been the cause of their luminosity—none of them attained the chrysalis state, and so the species was not absolutely decided.

† *Introd. to Entom, loc. cit.*

eight or ten inches in diameter. Madame Merian has exquisitely figured the tragical end of a tiny humming-bird, surprised by one of these monsters on her eggs; the petite bird overthrown under the fangs of the sprawling spider, one of whose feet is in the nest. It was on the authority of this lady that Linnæus gave the name of *avicularia* to the species. Later naturalists have scouted the whole story. Mr MacLeay, who resided in Cuba, says that there are indeed there huge spiders, allied to our garden spider, which make a geometric net, strong enough to embarrass small birds; but that these do not attempt to catch such prey, and never molest birds at all. On the other hand, he avers that the Cuban *Mygale*, an allied species to that of Guiana, makes no web, and has no power of injuring birds. He put this to the test of experiment; for having maimed a humming-bird, he thrust it into the *Mygale's* hole, which, instead of seizing the victim, retreated as in fear out of his den. This Mr MacLeay supposes to be conclusive; but a moment's reflection will shew how equivocal is the evidence. The spider may not have been hungry; or he may have been taken aback by the sudden intrusion; or he might not choose to take prey that he had not stolen upon and slaughtered *suo more;* or he may have muttered in the Arachnidan language,—

"Timeo Danaos, et dona ferentes."

Because a wolf will cower down in the corner of his lair —(even a tiger has been known to do so)—when a man

suddenly enters his presence, and will manifest the most abject fear, would it be philosophical to ridicule the tales told of wolves pursuing and devouring men by night?

M. Langsdorff asked the people of Brazil if the Caranquexeira, or the great *Mygale* of that country, fed upon humming-birds, when they answered him, with bursts of laughter, that it only gratified its maw with large flies, ants, bees, wasps, beetles, &c.; an answer which the traveller verified by his own personal experience.* If M. Langsdorff means, which of course he does, that he learned by personal observation that the spider *ordinarily* feeds on insects, that fact is indubitable, and never has been doubted; but if he means that he had experience that it eats *only* such prey, which is the question at issue, it is plain that this experience proves no more than that he never witnessed such a fact.

Percival, in his account of Ceylon, observes:—"There is an immense spider here, with legs not less than four inches long, and having the body covered with thick black hair." This was doubtless the *Mygale* of the island. "The webs which it makes are strong enough to entangle and hold even small birds, which form its usual prey." Alluding to this statement, Sir Emerson Tennent says:—

"As to the stories told of the *Mygale* catching and killing birds, I am satisfied, both from inquiry and observation, that, at least in Ceylon, they are destitute of truth, and that (unless in the possible case of acute suffering from hunger) this creature shuns all description of food

* *Exped. into Int. of Brazil.*

except soft insects and annelides." And yet he immediately adds:—"A lady at Marandan, near Colombo, told me that she had, on one occasion, seen a little house-lizard (*gecko*) seized and devoured by one of these ugly spiders."* Does he not, then, credit his informant? Or are lizards included in the category of "soft insects and annelides?"

Against this incredulity, resting on no better than negative evidence, one might adduce collateral proof from analogy. There *are* spiders which feed on vertebrate animals, and there *are* spiders whose webs catch birds. The large and beautiful *Nephila claripes* of tropical America weaves strong threads of yellow silk in the paths of the woods, converging to a web quite strong enough to arrest a bird of weak flight. It must have been a species allied to this, but certainly, I think, not the same, of which Dr Walsh speaks in his "Travels in Brazil." "Among the insects is an enormous spider, which I did not observe elsewhere. In passing through an opening between some trees, I felt my head entangled in some obstructions, and on withdrawing it, my straw hat remained behind. When I looked up I saw it suspended in the air, entangled in the meshes of an immense cobweb, which was drawn like a veil of thick gauze across the opening, and was expanded from branch to branch of the opposite trees as large as a sheet ten or twelve feet in diameter. The whole of this space was covered with spiders of the same species but different sizes; some of them, when their legs were expanded, forming a circle of six or seven inches in

* Tennent, *Ceylon*, ii. 226.

circumference.* They were particularly distinguished by bright spots. The cords composing the web were of a glossy yellow, like the fibres of silkworms, and equally strong."

There is a creature found in the tropical parts of both hemispheres, called *Solpuga,* which though not exactly a spider, is yet so closely allied to that family as to be in some measure responsible for its misdoings. It is about as large as the *Mygale,* and, with sufficient general resemblance to it to warrant its being popularly considered a spider, it has much the same habits and appetites. Captain Hutton, in a most interesting memoir, describes the details of an Indian species under the name of *Galeodes vorax.* Among many other details, he says—"This species is extremely voracious, feeding at night upon beetles, flies, and even large lizards; and sometimes gorging itself to such a degree as to render it almost unable to move. A lizard, three inches long, *exclusive of tail,* was entirely devoured; the spider sprung at it, and made a seizure immediately behind the shoulder, never quitting its hold until the whole was consumed. The poor lizard struggled violently at first, rolling over and over in its agony, but the spider kept firm hold, and gradually sawed away with its double jaws into the very entrails of the victim. The only parts uneaten were the jaws and part of the skin, although the lizard was at least five inches long from nose to extremity of tail. After this meal, the spider remained

* Probably we should read "diameter" for "circumference." A spider whose legs cover an area of six inches *in circumference* is by no means rare even in England.

gorged and motionless for about a fortnight, being much swollen and distended.

"A young sparrow, about half grown, was placed under a bell-glass with a *Galeodes;* the moment the luckless bird moved, the spider seized him by the thigh, which he speedily sawed off, in spite of the sparrow's fluttering; and then as the poor bird continued to struggle in pain, the savage seized him by the throat, and soon put an end to his sufferings by cutting off the head. It did not, however, devour the bird, nor any part of it, but seemed satisfied with having killed it.

"On another occasion, I gave it a large garden-lizard, which was instantly seized by the middle of the body; the lizard, finding that it could not shake off its adversary, turned its head, and bit the *Galeodes* on the leg, which obliged it immediately to quit its hold and retreat.

"On another occasion my friend, Dr Baddeley, confined one of these spiders in a wall-shade with two young musk rats (*Sorex Indicus*), both of which were killed by it."*

In an expedition to the Kurruckpoor Hills, south of Monghyr, Captain Sherwill found upon the summit of Maruk, a table-topped hill of 1100 feet elevation, several of the gigantic webs of the Epeira spider, some of which measured (including the guy-ropes) from ten to twelve feet in diameter, the reticulated portion being about five feet, in the centre of which the spider, of a formidable size and very active, sits waiting for prey. "The webs," he says, "from their great strength, offered a sensible resistance when

* *Journ. Asiat. Soc.*

forcing our way through them. In the web of one of the spiders we found a bird entangled, and the young spiders, about eight in number, feeding upon the carcase. The bird was, with the exception of its legs and beak, entirely enveloped in the web, and was much decomposed; the entwined web had completely pinioned the wings of the bird, so as to render its escape impossible. The bird was about the size of a field-lark, and was near the centre of the web; the old spider was about a foot above the bird: we secured, measured, and bottled him. Its dimensions were six inches across the legs, and it was armed with a formidable pair of mandibles."*

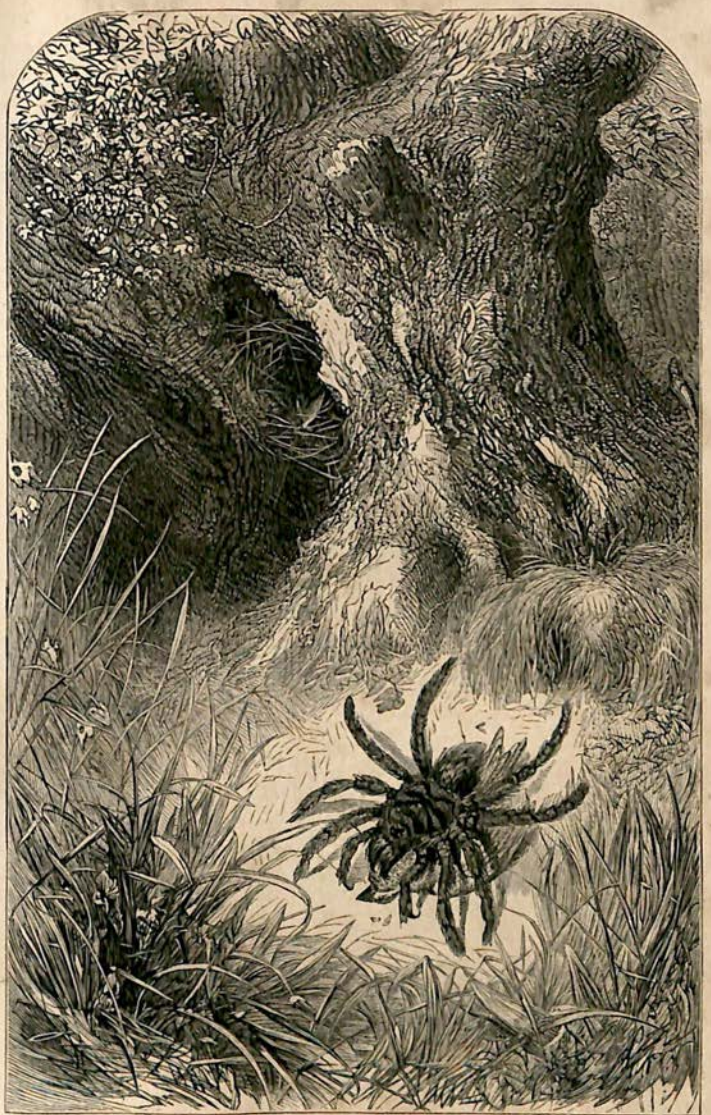
It is clear, then, that there is nothing absurd or contrary to probability in the statement that spiders attack, overcome, and devour birds. But Madame Merian is here again favoured with direct witnesses to sustain her good faith. M. Moreau de Jonnès expressly mentions, on his own authority, that the South American Mygale climbs the branches of trees to devour the young of humming-birds. But the most satisfactory statement is made by Mr H. W. Bates, who has recently returned from the interior of Brazil after many years spent in studying the entomology of that vast region. No one will deny his competency as a witness. "Now I will relate to you," he says, "what I saw in the month of June 1849, in the neighbourhood of Cameta. I was attracted by a curious movement of the large gray-brown Mygale on the trunk of a vast tree: it was close beneath a deep crevice or chink in the tree,

* *Proc. Entom. Soc.*, November 1, 1852.

across which this species weaves a dense web, open for its exit and entrance at one end. In the present instance the lower part of the web was broken, and two pretty small finches were entangled in its folds; the finch was about the size of the common siskin of Europe, and I judged the two to be male and female; one of them was quite dead, but secured in the broken web; the other was under the body of the spider, not quite dead, and was covered in parts with the filthy liquor or saliva exuded by the monster. I was on my return from a day's excursion by land at the time, with my boxes full of valuable and delicate insects, and six miles from my house, and therefore could not have brought the specimens home, even if I had wished, which I did not, as the spider was a very common species, easily to be procured nearer home. The species I cannot name; I sent several fine specimens, stuffed, to London, in 1851; it is wholly of a gray-brown colour, and clothed with coarse pile. Doubtless you will immediately know the exact species to which I refer.

"If the Mygales did not prey upon vertebrated animals, I do not see how they could find sufficient subsistence.

"On the extensive sandy campos of Santarem, so bare in vegetation, there are hundreds of the broad slanting burrows of the large stout species, (that fine one, dark brown with paler lines down the legs, of which I sent specimens in 1851.) The campos, I know, from close research, to be almost destitute of insects, but at the same time to swarm with small lizards, and some curious ground finches of the Emberiza group (one of which has a song



BIRD-EATING SPIDER.

wonderfully resembling our yellow bunting of England), besides which, vast numbers of the *Caprimulgidæ* and ground doves lay their eggs on the bare ground.

"I believe this species of Mygale feeds on these animals and their eggs at night. Just at the close of day, when I have been hurrying home, not liking to be benighted on the pathless waste, I have surprised these monsters, who retreated within the mouths of their burrows on my approach."*

* *Proc. Entomol. Soc.*, July 2, 1855.

VIII.

FASCINATION.

It is a notion of long standing and widely diffused, that certain predaceous animals have a power, which, however, they only occasionally exert, of paralysing the creatures on which they prey, so as utterly to take away the faculty of flight, and even, in some circumstances, of drawing them, as if by an irresistible influence, to their known and dreaded destruction. This fascinating power has been most generally attributed to serpents, and is supposed to reside in a peculiar glare and fixity of the eyes, which appear to mesmerise the victims. If the gaze be interrupted, *on either part*, though but for a moment, it is supposed that the spell is broken. Is there any such power? or is it merely one of the many myths with which popular natural history is still burdened, and which it is the province of real science to explode? Let us gather together a few of the facts on which the opinion rests.

I am not sure whether I ought to reckon as such the following statement, for I do not know the value of the authority on which it rests. It is, however, sufficiently curious.

Dr Bird, a somewhat appropriate authority in this case, mentions an incident which happened in America.

"Two boys lighted by chance upon a large black snake; upon which one of them resolved to ascertain whether the snake, so celebrated for its powers, could fascinate him. He advanced a few steps nearer the snake, and made a stand, steadily looking on him. When the snake observed him in that situation, he raised his head with a quick motion, and the lad says, that at that instant there appeared something to flash in his eyes, which he could compare to nothing more similar than the rays of light thrown from a glass or mirror when turned in the sunshine; he said it dazzled his eyes; at the same time the colours appeared very beautiful . . . . he felt as if he was in a whirlpool, and that every turn brought him nearer to the centre. His comrade seeing him approach nearer to the snake, immediately ran and killed it." *

There is, however, better authority than this for the belief in serpent-mesmerism. Professor Kalm states of the Rattlesnake of North America, that it will frequently lie at the bottom of a tree on which a squirrel is seated. The snake fixes his eyes upon the little animal, and from that moment it cannot escape: it begins a doleful outcry, runs up the tree a little way, comes down again, then goes up, and afterwards comes still lower. The snake continues at the bottom of the tree, with its eyes fixed on the squirrel; and its attention is so entirely taken up, that a person accidentally approaching may make a considerable noise, without so much as the snake's turning about. The squirrel comes lower, and at last leaps down to the snake,

* *Peter Pilgrim.*

whose mouth is already wide open for its reception. The little animal then, with a piteous cry, runs into its jaws and is swallowed.

Catesby, though he says he never saw the phenomenon himself, reports the same thing on the testimony of many witnesses, who all agreed that the animals, particularly birds and squirrels, no sooner spy the snake than they skip from spray to spray, hovering and approaching gradually nearer their enemy, regardless of any other danger; but with distracted gestures and outcries descend, though from the top of the loftiest trees, to the mouth of the snake, who, opening his jaws, takes them in and in an instant swallows them.*

More recently Acrell tells the same story, as unquestionable. He declares that as the snake, who is the most indolent of all serpents, lies under the shade of a tree, opening his jaws a little, he fixes his brightly-glittering eyes on any bird or squirrel which is in it. The squirrel, uttering a mournful and feeble cry, leaps from bough to bough, as if seeking to escape, but presently, as if struck with the fascination, he comes down the tree, and flings himself, with a spring, into the very jaws of his enemy. A mouse, shut up with a rattlesnake in an iron box, at first sat in one corner, the snake opposite to it. The reptile fixed its terrible eye on the little trembler, which at length threw itself into the mouth of the serpent.†

Lawson affirms that *he has seen* the phenomenon actually take place with a squirrel and a rattlesnake.‡

* *Hist. of Carolina.* † *Amœnit. Acad.* ‡ *Hist. of Carolina.*

I said that the belief is widely spread. We have seen it in North America; we will now look at it in Africa.

Captain Forbes incidentally mentions a case analogous to these. Passing through some high grass at Ahomey, he observed, within an inch of his leg, a small lizard, with its eyes fixed. It did not move at his approach. At the same moment a cobra darted at it, and before he could raise his stick, bore the victim away. The captain naturally enough was occupied with his own narrow escape, and simply narrates the facts without comment; but the fixity of the gaze, and the motionlessness of the lizard, were not a little remarkable.*

Mr Ellis, in his charming volume on Madagascar and the Cape, makes the following observations:— †

"In a country abounding, as Africa does, with serpents, I expected to hear many anecdotes respecting them; and, conversing on one occasion with Mr Pullen, a farmer who has lived many years in the country, and seemed to have paid rather more than usual attention to this species of reptile, he said he once saw a mouse running in a field, and that, coming in sight of a snake, though at a considerable distance, it instantly stopped. The snake fixed its eye on the mouse, which then crept slowly towards the snake, and, as it approached nearer, trembled and shrieked most piteously, but still kept approaching until quite close, when it seemed to become prostrate, and the snake then devoured it. On another occasion he had watched a snake capture a mouse in the same manner; but, as it was

* *Dahomey and the Dahomans.* † *Visits to Madagascar*, 231.

retreating, he followed, and struck it on the back with a stick, when it opened its mouth, and the mouse escaping, ran for some distance, then fell down; but after a minute recovered and ran away. Another time he said he watched a snake in the water, which had fixed its eye on a frog sitting amongst the grass on the bank. The frog, though greatly alarmed, seemed unable to stir, until Mr Pullen gradually pushed a rush growing near so that it intervened between the eye of the snake and its intended victim, when the frog, as if suddenly liberated, darted away. Mr Pullen's ideas were in accordance with the popular notion, that the snake has the power of exercising some mesmeric or other influence through the steady fixing of its eye, and that whatever intercepts this gaze breaks, as it were, the charm, and sets the prisoner free."

A most important witness on this matter is Dr Andrew Smith, the learned zoologist of South Africa, who thus soberly throws the weight of his own thoroughly competent and most conclusive personal observations into the affirmative scale. In his interesting account of the Boomslange, a serpent of considerable size found in that region, he says:—

"As this snake, *Bucephalus capensis*, in our opinion, is not provided with a poisonous fluid to instil into wounds which these fangs may inflict, they must consequently be intended for a purpose different to those which exist in poisonous reptiles. Their use seems to be to offer obstacles to the retrogression of animals, such as birds, &c., while they are only partially within the mouth; and, from

the circumstance of these fangs being directed backwards, and not admitting of being raised so as to form an angle with the edge of the jaw, they are well fitted to act as powerful holders when once they penetrate the skin and soft parts of the prey which their possessors may be in the act of swallowing. Without such fangs escapes would be common; with such, they are rare.

"The natives of South Africa regard the *Bucephalus capensis* as poisonous; but in their opinion we cannot concur, as we have not been able to discover the existence of any glands manifestly organised for the secretion of poison. The fangs are enclosed in a soft, pulpy sheath, the inner surface of which is commonly coated with a thin glairy secretion. This secretion possibly may have something acrid and irritating in its qualities, which may, when it enters a wound, occasion pain and even swelling, but nothing of greater importance.

"The *Bucephalus capensis* is generally found upon trees, to which it resorts for the purpose of catching birds, upon which it delights to feed. The presence of a specimen in a tree is generally soon discovered by the birds of the neighbourhood, who collect around it, and fly to and fro, uttering the most piercing cries, until some one, more terror-struck than the rest, actually scans its lips, and, almost without resistance, becomes a meal for its enemy. During such a proceeding the snake is generally observed with its head raised about ten or twelve inches above the branch round which its body and tail are entwined, with its mouth open and its neck inflated, as if anxiously en-

deavouring to increase the terror which it would almost appear it was aware would sooner or later bring within its grasp some one of the feathered group.

"Whatever may be said in ridicule of fascination, it is nevertheless true that birds, and even quadrupeds, are, under such circumstances, unable to retire from the presence of certain of their enemies; and, what is even more extraordinary, unable to resist the propensity to advance from a situation of actual safety into one of the most imminent danger. This I have often seen exemplified in the case of birds and snakes; and I have heard of instances equally curious, in which antelopes and other quadrupeds have been so bewildered by the sudden appearance of crocodiles, and by the grimaces and contortions they practised, as to be unable to fly or even to move from the spot towards which they were approaching to seize them."*

It may have been the Boomslange to which Le Vaillant alludes, who says that he saw, on the branch of a tree, a species of shrike, trembling as if in convulsions; and at the distance of nearly four feet, on another branch, he beheld a large species of snake, that was lying with outstretched neck, and fiery eyes, gazing steadily at the poor animal. The agony of the bird was so great, that it was deprived of the power of moving away; and when one of the party killed the snake, the shrike was found dead upon the spot, and that entirely from fear; for on examination it appeared not to have received the slightest wound.

* *Zoology of South Africa*—Reptilia.

The same traveller informs us, that a short time afterwards he observed a small mouse, in similar agonising convulsions, about two yards distant from a snake, whose eyes were intently fixed upon it; and on frightening away the reptile, and taking up the mouse, it expired in his hand.*

In a record, by Mr D. T. Evans, of some experiments with Venomous Serpents, made at the Zoological Gardens, mainly with a view to test the efficacy of a reputed remedy for their bite,—*Simaba cedron*—and which were pursued with the utmost philosophic care, we find the following interesting particulars:—"The attitudes and movements of the serpent intending to bite were very striking and beautiful. In the first place, he made, with the posterior half of his body, a bold curve, having a strong prehensile 'purchase' on the floor of the cage, so as to secure a steady fulcrum for the rapid dart made at the time of the bite. The upper half of the body was raised some ten inches or a foot, the neck strongly arched, and the head, bent at nearly right angles with the neck, was poised directly opposite the prey. In such position the serpent remained a greater or lesser time (sometimes as long as twenty minutes) according to circumstances. During this interval, the slightest motion of the animal before him was followed by an instantaneous and correspondent movement of the head and neck of the serpent. The purpose seemed to be that of aim-taking, for the eyes were intently fixed upon the prey; but I am by no means sure that the

* *Oiseaux d'Afrique.*

snake, knowing that the latter cannot escape him, does not derive pleasure from this prolonged and intent gaze. At all events, in one experiment, where the head of a rattlesnake so engaged was sideways to the glass of the cage, and near it, I observed, and called attention to the fact, a remarkable vermicular motion along the course of the poison-gland to the opening of the angle of the mouth, which we thought might afford him pleasure, and this continued until the snake struck his prey.

"So far the Serpents. I now proceed to describe the peculiarities shewn by the animals on which we experimented. Some philosophers have denied innate ideas to man; these and some others have furthermore denied an instinctive apprehension of danger in animals. They say that of itself, as born, the hare has no dread of the hound: that its fear is acquired of experience. I concur in neither of these opinions, and think the latter altogether refuted by the conduct of the animals exposed to serpents in these experiments. Not one of the guinea-pigs or rabbits (which were all something under their full growth) had ever seen a serpent; yet when introduced to the cage they shewed unequivocal symptoms of distress and fear. In some instances they actually screamed before they were struck. They generally shewed restlessness at first, but when the serpent, intending to strike, poised himself in front, they became for a time, if not altogether, motionless. Is there such a thing as 'fascination?' If by this is meant a pleasurable paralysis of the animal's powers, I think it more than doubtful; but a deprivation

of the power of motion from terror may, perhaps, take place. All, however, that I speak to is a perfectly motionless condition of snake and prey, lasting several minutes."*

Nor are there wanting examples of the same power exercised by the common Snake of our own country. I content myself with the following two, both of very recent record :—

"Up the hill above Tyneham," writes the Rev. Henry Bond, last August, "towards the sea, I was struck by the shrill cry and fluttering agitation of a common hedge-sparrow, in a whitethorn bush. Regardless of my presence, its remarkable motions were continued, getting, at every hop from bough to bough, lower and lower down in the bush. Drawing nearer, I saw a common snake coiled up, but having its head erect, watching the sparrow ; the moment the snake saw me it glided away, and the sparrow flew off with its usual mode of flight."†

This anecdote brings out another by Mr John Henry Belfrage, of Muswell Hill:—"When proceeding down the avenue here one morning, at a turn in the path I saw a robin, which appeared to me spell-bound, so much so as to allow a much closer approach than is usual even with that boldest of the feathered tribe. On going nearer I perceived what I took to be the cause, in a large common snake, which was lying coiled up on one side of the path, with its head a little raised. My appearance broke the

* *Times* Newspaper, November 9, 1852. † *Zoologist*, 7273.

spell, and the robin flew away; at the same time, the snake dropped its head and assumed a perfectly inert appearance." *

A writer in the *Journal of the Indian Archipelego* thus reports the mesmeric faculty exercised upon a certainly somewhat unlikely subject:—"On approaching an almost dry drain, I saw a snake slowly extending his coils, raising his head, and steadfastly gazing on what I saw to be an eel of about a foot in length. The eel was directly opposite to the snake, and glance seemed to meet glance, when the snake, having the requisite proximity, darted on the eel and caught it about an inch behind the head, and carried it off; but the captor was soon himself a captive, for with a blow on his head I secured both." †

The mystery is, as usual in such cases, attempted to be explained away. Man does not like mystery; scientific man least of all: it is humbling to the pride of science to be obliged to confess that there exists anything unaccountable to the initiated. Mr W. C. L. Martin thus "explains" the statements of Dr A. Smith, and all such accounts:—"There is nothing mysterious in all this; the snake does not *mesmerise* its prey, but merely so terrifies it as to stupify it; besides, the victim may feel an impulse similar to that which urges many nervous persons on the edge of a precipice, or top of a lofty tower, to throw themselves down headlong, and which we have heard such describe as resisted with difficulty; so may the

* *Zoologist*, 7382. † Quoted in the *Zoologist*, 2397.

panic-struck bird feel an impulse to rush into danger which it might escape by flight."*

And again:—"Fear, amounting to panic, solicitude for its young, and efforts to drive away the dreaded intruder, leading the bird to venture too closely to the snake for its own safety, produce the results erroneously attributed to the Reptile's fancied power of fascination by its glance, or by some mystic property."†

Dr Barton, of Philadelphia, who, at the close of the last century, published a memoir on the fascinating powers attributed to certain serpents, advocated the same views. He considered that in almost every instance the supposed power was exerted on birds at the particular season of nidification, and that the whole hypothesis originated in the στοργὴ which prompts them to protect their eggs or young. No doubt *some* of the instances which have been reported as examples of fascination are capable of such an explanation, but surely not all; and the fallacy, here again, as in so many parallel cases, lies in the advocating of some theory which will cover a certain number of the facts, and the ignoring of all such as will not be so accounted for. Is it to be supposed that Dr A. Smith could not distinguish between the condition of involuntary paralysis of the faculties which he says he has *often* seen, and the insane boldness of nesting birds? Had the mice, seen by Mr Pullen, had the frog, young ones to protect? Or the squirrel mentioned by Kalm? or the mouse seen by Le Vaillant? or the eel in the drain? But what is the value

* *Pict. Museum*, ii. 107.

† *Reptiles*, (Rel. Tr. Soc.,) 206.

of a hypothesis,—so far as its claims to solve this question are concerned,—which will not touch these cases? When Mr Martin denies that there is anything mysterious in the matter, and in the same sentence admits that "the victim may feel an impulse to rush into the danger which it might escape," he just yields the whole point. I venture to affirm that this *is* something mysterious, some thing totally unaccountable. I ask *what*, and *whence*, and *why*, this strange impulse that overcomes the first of all instincts, the prime law of self-preservation?

It does not explain the cause of the phenomenon, though it possibly helps us to determine its proper seat, to learn that fascination belongs to other animals besides the serpent tribes. We shall perhaps not err if we conclude that the peculiarity resides not in the object, but in the subject; that it is a mental emotion capable of being excited by objects having little in common except the death-terror which they excite. I have no doubt that it is a phase of extreme terror; the singularity of the phenomenon consists in the reversal of ordinary instinctive laws which it induces. My readers will probably be interested in the details of some cases in which the exciters of the emotion were animals other than serpents. Here is one, apparently related with care and truthfulness, though anonymous, in which the fascinator was as unlikely as can be well imagined to excite, and the fascinatee to feel, the emotion:—

"One evening, being seated in a room at Garrackpore, the window of which was open, and the ceiling on one side

sloped downwards towards the window, my attention was attracted by a butterfly which chanced to fly into the room. I observed its motions for a minute or two, when I thought there was something that appeared unnatural in them, and the insect began to dart to and fro in one direction, occasionally, however, varying its flight about the room. I looked up to see what it could possibly be at, and instantly observed an ordinary-sized lizard on the cloth of the upper ceiling. I had not even then the most distant idea of what was really going on; but seeing the butterfly dart every now and then at the lizard, I supposed it in play, till its motions became less quick and animated. The lizard remained all this time immovable, but at last suddenly shifted its ground to the sloping part of the ceiling. The motions of the butterfly became still more languid, until at length, to my utter surprise, I saw the lizard open its mouth, and the butterfly flew directly into it. The lizard was about half a minute swallowing it, wings and all. Until the last act of this curious scene, though I well knew the lizard's object, I supposed it would probably make a leap at the butterfly, yet had no idea of its succeeding, and expected to see the butterfly fly away. Had I had an idea of the cause, I should have broken the charm.

"From that moment I never had the least doubt of the power of fascination: that power I conceive to be *terror*, which, if the object was sufficiently terrible, I believe would act equally on man or any other creature." *

Still more strange is it to hear of scorpions fascinating

* *Bengal Sporting Mag.* for Oct. 1836; cited in the *Zoologist*, 5070.

blue-bottle flies! "On my arrival" says Mr Robert Hunter, "at Nágpur, in Central India, in 1847, I requested that the first scorpion found in the house might be allowed to live for a few minutes, that I might have an opportunity of observing its form and movements. In that part of India one has rarely to wait long for such a visitant, and on an early evening my colleague, the Rev. Mr Hislop, announced that there was a scorpion on the wall. A lamp was set down on the floor, and we took convenient stations for noting what might pass. Just then a large fly, of the genus Musca, made its appearance, and soon became aware of the presence of the scorpion. A strong fury seemed to seize it, irresistibly impelling it to an insane attack on the terrible occupant of the wall: it flew at it with all the little force it could muster, the scorpion meanwhile stretching out its lobster-like claw to catch it as it came. At the first charge, the fly rebounded from the crustaceous integument of its adversary, having done no more damage than if a child were to apply its hand to the well-mailed body of a cuirassier. It seemed amazed at its own audacity; and in a state of great apparent agitation wheeled round, and taking precipitately to flight, soon put two or three yards of safe space between itself and its formidable but wingless foe. We now forcibly hoped 'the better part of valour' might be allowed to prevail. But no! the tiny creature stood—it ventured to look—there glared still in view the malignant form. What could the poor animal do but make a second brilliant onset, in which it again eluded

the outstretched claw of its enemy, and, as before, was successful in effecting a retreat? 'Surely,' we mused, 'no further knight-errantry will be attempted: the most exacting would consider this enough.' But we were mistaken. Again and again did the fly return to the combat, till in an unguarded moment it flew exactly into the open claw, which closing, rendered escape impossible. The generosity of a Mouravieff was scarcely to be looked for in the scorpion, which, as will be readily believed, lost no time in devouring its gallant captive. Possibly the fly may have been partly dazzled by the glare of the lamp. But undoubtedly it was in the main fascination, induced by the sight of the dread figure on the wall, that impelled it to begin the unequal contest, which could terminate only in the loss of its life." *

After these cases, I fear my readers would see but little of the romantic in stories of stoats mesmerising hares and rabbits, or foxes paralysing pullets. The former are common enough,—the wretched hare creeping along with a bewildered look, as if its back were broken, or screaming in helpless immobility. I will confine myself to a single narrative furnished by Mr Henry Bond, to whom this chapter is already indebted for one case. As he was walking on the hillside above West Creech Farm, in Penbeck, Somerset, last August, where the down is scattered with very low furze-bushes, his attention was arrested by a cry of distress. It proceeded from a rabbit which was cantering round in a ring, with a halting gait.

* *Zool.*, 5214.

He watched it for some minutes; but, as the circle became smaller, and the rabbit more agitated, he perceived a stoat turning its head with the rabbit's motion, and fixing its gaze upon it. He struck a blow at the stoat, but missed it; its attention was thus withdrawn from its intended victim, which instantly ran away with great vigour in a straight direction.*

This is a remarkably good case; the circular movement of the rabbit; the ever-diminishing circle; the rotation of the stoat; the fixity of its gaze; the liberation of the rabbit the moment the stoat was disturbed; and the instant recovery of its faculties on the breaking of the spell;—all these are circumstances of the highest interest in a case avouched by so good a naturalist as Mr Bond.

Mr J. H. Gurney reports the account of a respectable gamekeeper, who, being much annoyed by the nightly visits of a fox to the poultry, could not imagine how Reynard managed to effect his purpose, as they roosted on a large spreading oak. One morning, however, just as day was dawning, he heard a great noise among the poultry, and, looking out of the window, saw a fox running round and round under the place where they sat, and soon observed that the fowls began to fall from the tree in great confusion. The fox immediately seized his victim, and the mystery was so far solved. A day or two afterwards the fox, a very large male, was killed in an adjoining paddock, and no further assaults were made upon the poultry.

* *Zool.*, 7273.

In this case the result was possibly effected by vertigo; the birds, bewildered and amazed in the dim light, followed with their eyes the course of the sly depredator, as he ran swiftly in a circle beneath, until the frequent turning of their heads made them giddy and unable to keep their balance. *But how did the fox know that such a result would follow?*

The same gentleman gives, from his own observation, a case that is more to the point. Here a bird is the mesmeric practitioner. "I once saw a golden eagle which appeared entirely to fascinate a rabbit that was put into the large cage in which the eagle was kept. As soon as the rabbit was introduced, the eagle fixed his eye upon it, and the rabbit intently returned the gaze, and began going round the eagle in circles, approaching nearer each time, the eagle meanwhile turning on his axis (as it were) on the block of wood upon which he was seated, and keeping his eye fixed upon that of the rabbit.

"When the rabbit had approached very near to the bottom of the eagle's perch, it stood up on its hind legs, and looked the eagle in the face; the eagle then made his pounce, which appeared at once to break the charm, and the rabbit ran for its life, but it was too late for it to escape the clutch of the eagle, and the instant death which followed that tremendous squeeze." *

I am not sure how far a parallelism exists between this animal fascination by the eye, and that attraction which

* *Zool.* 4049, 4050.

fire is well known to possess for many creatures. Shelley sings of

"The desire of the moth for the star,"

as if it were a romantic passion for that which is bright and beautiful. This is, of course, a poet's aspect; the insect-collector, who wants to fill his cabinet—"my friend the weaver," who nightly pursues his "untaxed and undisputed game"—well knows that the glare of his bull's-eye lamp will attract the moths by thousands on a damp night in June. The little flitting atoms pass and repass across the field of light, suddenly flashing into full radiance, and in an instant relapsing into the darkness, unless his gauze net is too rapid for them. I have often sat reading late at night with a candle in the window, and observed with interest how many insects of all orders will soon congregate on the outside; now and then some large moth coming up with a dull *thud*, or a great mailed beetle dashing against the glass with a crash that makes one look sharply up to see whether he has not cracked the pane. In Jamaica I have taken many valuable beetles and other insects around the candle-shades at an open window, which were not met with in any other way.

So in Alabama, where it is customary in balmy autumn evenings for the family to sit in the yard under the broad sheltering trees, by the flickering light of the yard-fire. This fire is lighted at dusk on an iron tripod breast-high, and kept up till bed-time. It is the duty of a negro urchin to keep it constantly bright with splints of pine, so as to maintain a perpetual blaze, as the object is to

illuminate the yard and its contiguous offices. The little "nigger" nods, of course, but the loud scolding voice of master, mistress, or overseer, or any one else, rates him, and rouses him to duty, as soon as the flame falls. It is pleasant to sit and watch the effect of the light, either transmitted through or reflected from the quivering leaves of the surrounding trees, the blaze now rising brightly and playing in tongue-like flickering spires, now sinking and dying to a ruddy glow, then suddenly reviving under the frightened watchfulness of the sable minister, who plays the part of vestal virgin at this altar.

Large insects often play around this fire. Beetles "wheel their drony flight" in buzzing circles round for a few turns, and are gone; and moths come fluttering about, and often scorch their plumy wings. I have taken some very fine Sphinges and other moths thus; and the only specimen I ever saw of that very curious insect the Mole-cricket alive (a species distinct from, but very closely allied to, our European insect) was one that suddenly dashed into the ashes of the light-stand—a curious and interesting circumstance, when connected with the opinion that I have before alluded to, that the *Gryllotalpa Europæa* is one of the producers of the *Ignis fatuus*.

Birds also are attracted by light at night. I have read of a Titmouse that was seen fluttering around a gas-lamp in the suburbs of London, and would not be driven away; it at length made its entrance into the lamp through the orifice at the bottom, and continued to flit around and across the jet. In 1832, a Herring-gull struck one of the

mullions of the Bell Rock Light-house with such force, that two of the polished plates of glass, measuring about two feet square, and a quarter of an inch in thickness, were shivered to pieces, and scattered over the floor in a thousand atoms, to the great alarm of the keeper on watch, and the other inmates of the house, who rushed instantly to the light-room. The gull was found to measure five feet between the tips of the wings. In his gullet was a large herring, and in his throat a piece of plate-glass of about one inch in length.

Dr Livingstone gives some curious examples of the attractive power of fire over various creatures in South Africa, which he attributes to a sort of fascination. "Fire," he says, "exercises a fascinating effect on some kinds of toads. They may be seen rushing into it on the evenings without ever starting back on feeling pain. Contact with the hot embers rather increases the energy with which they strive to gain the hottest parts, and they never cease their struggles for the centre, even when their juices are coagulating and their limbs stiffening in the roasting heat. Various insects also are thus fascinated; but the scorpions may be seen coming away from the fire in fierce disgust, and they are so irritated as to inflict at that time their most painful stings."*

* *Travels*, 144.

IX.

SERPENT-CHARMING.

FROM the day when the solemn doom was pronounced,—"I will put enmity between thee and the woman, and between thy seed and her seed," the serpent-form has begotten revulsion and dread in the human breast. And deservedly; for a venomous serpent is a terrible enemy: the direful venom of sin injected by "that old serpent, the Devil," is well symbolised by the most potent of all lethic agencies,—the poison of the rattlesnake or the cobra.

And yet in all ages there have been persons in the countries where the most venomous snakes abound, who have professed, and have been believed to enjoy, an absolute immunity from their bites, and even to exercise some inexplicable power over them, whereby their rage is soothed, and they are rendered for the time gentle and harmless. The Holy Scriptures repeatedly allude to this ancient art. The Magicians of Egypt, who turned their rods into serpents, are supposed to have had recourse to a secret known, it is said, to the modern conjurors of the same country, who, by pressing the nape of the neck of the cobra with their fingers, throw it into a sort of catalepsy, by which its whole body becomes rigid like a rod, and from which it is relieved by suddenly throwing it on the ground.

Aaron's rod was a veritable rod before and after the transaction, but changed into a serpent by Divine miraculous energy: theirs were serpents made to assume the appearance of rods for the moment by a cunning device.

Other and more direct allusions, however, occur to the art of serpent-charming. Thus the obduracy of the wicked is compared to "the deaf adder that stoppeth her ear; which will not hearken to the voice of charmers, charming never so wisely."* And the inexorable severity of the Chaldean invaders is depicted under this imagery:—"Behold, I will send serpents, cockatrices, among you, which will not be charmed, and they shall bite you, saith the LORD."†

Among the ancient Romans the Psylli, a people of Africa, and the Marsi, a German tribe who had settled in Italy, were reputed to have the power of charming serpents, and to be endowed with immunity from the results of their venom. Celsus, however, maintains that this power consisted in an acquaintance with the fact, now well known, that animal poisons are hurtful only when mingled with the blood. They may therefore be taken into the mouth with perfect impunity. With reference to so great an authority, however, there is more in the art and mystery of serpent-charming than this.

When Lucian describes the Babylonian magician as walking abroad, and calling to him all the serpents that were near, with certain ceremonies, such as the utterance of sacred words from an ancient book, lustrations made

* Psalm lviii. 4, 5. † Jer. viii. 17.

with sulphur and a torch, and solemn marchings in a circle, and when he asserts that the venomous reptiles, *nolentes volentes*, presented themselves harmless at his feet,—he describes a scene which is sufficiently familiar to European travellers in Egypt and India. And so, when Silius Italicus speaks of Atyr, instructed how to disarm serpents of their dire venom, and to lull to sleep the terrible water-snakes with his magic touch, he refers, whether truly or falsely, to something of a more potent character than the feat by which Queen Philippa saved the life of her royal husband.

Immunity from the poison of serpents, and serpent-charming, are two things. The former, so far as it depends on the natural law already mentioned, scarcely comes within the province of this work. But is there not an innate immunity residing in some persons, and even in some peoples, by which, without the operation of any recognised natural law, or even any effort, they are securely protected either against the bites of venomous serpents, or, at least, against the fatality which is the ordinary result of being bitten?

The Psylli, according to Pliny, were so characteristically endowed with this immunity, that they made it a test of the legitimacy of their children; for they were accustomed to expose their new-born babes (only in doubtful cases, we may suppose) to the most venomous serpents they could find; assured that if their paternity was pure Psyllic, they would be quite unharmed. Of this tribe was the ambassador Hexagon, who, boasting of his power

before the Roman consuls, submitted to the crucial test which they suggested, of being inclosed in a vessel swarming with poisonous reptiles, which, says the legendary story, hurt him not.

The same historian tells us that the Psylli, who formerly inhabited the vicinity of the Greater Syrtis,—that is, the modern Tripoli and Barca,—were conquered and almost exterminated by the Nasamones, who possessed their land; but that a remnant fled to some distant region. It is not improbable that the present inhabitants of Sennaar, on the south of Egypt, may be the lineal descendants of these same Psylli; for, since Egypt was densely peopled and highly cultivated, a barbarous tribe could scarcely have made good their footing there; and as on the other side was the Great Desert of the Sâhra, and on the north the sea, there was no resource open to them but to creep along the desert edge of Egypt till they found a thinly-inhabited land sufficiently savage to enable them to form a settlement. The first region of this character that they could possibly find would be Nubia; and there it is most interesting to know that there exists a people at the present time, pretending to the same powers as the old Psylli. Bruce, whose testimony, at first much impugned, has come to be received with confidence, avouches that all the black people in the kingdom of Sennaar, whether Funge or Nuba, are perfectly armed against the bite of either scorpion or viper. They take the *Cerastes*—a little asp with two horns, of the most deadly venom—into their hands at all times, put them into their

bosoms, and throw them at one another as children do balls, without ever irritating them by this usage so much as to make them bite. One day when the traveller was sitting with the brother of the prime minister of Sennaar, a slave of his brought a *Cerastes*, which he had just taken out of a hole, and was using with every sort of familiarity. Bruce expressed his suspicion that the teeth had been drawn, but was assured that they were not, both by the slave and by his master, who, taking the viper from him, wound it round his arm, and at the traveller's desire, ordered the servant to accompany him with it to his residence. Here Bruce, to test the power of the serpent, took a chicken by the neck, and made it flutter; the seeming indifference of the snake immediately gave place to eagerness, and he bit the fowl with great signs of anger, which died almost immediately. Bruce considers that the indifference was only seeming towards the man,—that it was indeed powerlessness, for he constantly observed that, however lively the snake was before, yet upon being seized by any of the blacks, it seemed as if taken with sudden sickness and feebleness, frequently shut its eyes, and never turned its mouth towards the arm of the person who held it.

How exactly this account agrees with the words of Silius,

"—— *tactuque* graves *sopire* chelydros."

The Nubian traveller informs us that the Arabs—meaning apparently the Moslem blacks—have not this secret naturally, but that from infancy they acquire an

exemption from the mortal consequences attending the bites of all venomous reptiles by chewing a certain root, and washing themselves (it is not *anointing*) with an infusion of certain plants in water. This is by no means improbable; and it were much to be desired that the root and the plants were obtained and identified, that their preventive powers might be tested by competent men of science. In all probability they would be found to belong to the Quassia tribe, the natural order *Simarubaceæ*, plants of the tropical regions of both continents, whose juices are of an intense bitterness. An infusion of the chips of *Quassia amara* and of *Simaruba amara* is found to be an effectual poison to flies; and the Brazilian Indians use an infusion of *Simaruba versicolor* as a specific against the bite of serpents, and use it with great effect in the pediculous diseases which are so common among that people.

It was a plant of this order, *Simaba cedron*, on which experiments were made a few years ago, at the Zoological Gardens, just before the lamentable death, by the bite of the Cobra, of poor Gurling, who, indeed, assisted in them. Mr Squire, the eminent chemist, was desirous of testing the powers of this plant, which, dried and reduced to powder, is in high repute among the Indians of South America as a serpentifuge. Dr Quain and Mr Evans concurred in this desire; and, with the permission of the Zoological Society of London, a series of experiments, of much interest, if not very conclusive in their results, were performed at the Gardens, on the 8th July 1852.

The trials were made only on small animals, but in each case the alleged remedy proved inefficacious. The experimenters, however, think that it would be unsafe to reject the *Simaba cedron* as an antidote because it here failed, inasmuch as death followed so rapidly that there was small opportunity for its action. It is not until it shall have been tried and have failed upon stronger animals, that, in the face of the experience of the Indians in hot climates, it should be repudiated. The remedy was applied in the form of an infusion poured down the throat of the bitten animal as quickly as possible after the stroke, and of the moistened powder applied to the wound. It seems to me worthy of consideration whether, in the light of what Bruce says of the Nubians, a washing of the body with the infusion, or an imbibition of it, or both, *before* the serpent's attack, might not be more efficacious as a preventive either of the bite or of its results, than its administration afterwards as a cure. Whatever be the substance with which the Nubians wash themselves, it seems to communicate to the body some quality, perhaps of odour, which repels and sickens serpents. Now, this may reside in the intense bitterness of the *Simarubaceæ;* and it would be worth while to try whether a rattlesnake or a puff-adder would strike a guinea-pig that had just been bathed in an infusion of the *Simaba*, or to which a dose of the same had just been administered, and if so, whether the bite then would be fatal. Even if these experiments yielded no positive result, it would still be open to consider whether the lapse of time, or a long sea-

voyage, or exposure to our moist climate, may not have deprived the powdered root of the plant of antitoxic properties which it may have possessed when freshly prepared in its native region.

Tschudi, whose researches into the natural history of Peru are replete with interesting and valuable information, has some observations on the native remedies for serpent-bites which I will cite, prefacing the extract with a graphically terrible picture from his pen of the venomous reptiles themselves:—

"The serpents are to be feared; and, on approaching them, it is not easy to decide at the first view whether they belong to a poisonous or innoxious species. In the forests, where the fallen leaves lie in thick moist layers, the foot of the hunter sinks deep at every step. Multitudes of venomous Amphibia are hatched in the half-putrescent vegetable matter; and he who inadvertently steps on one of these animals may consider himself uncommonly fortunate if he can effect his retreat without being wounded. But it is not merely in these places, which seem assigned by nature for their abode, that loathsome reptiles are found: they creep between the roots of large trees, under the thickly-interwoven brushwood, on the open grass-plats, and in the maize and sugar-cane fields of the Indians; nay, they crawl even into their huts, and most fortunate is it for the inhabitants of those districts that the number of the venomous, compared with the innoxious reptiles, is comparatively small. Of the poisonous serpents, only a few kinds are known whose

bite is attended with very dangerous consequences. The minamaru or jergon (*Lachesis picta*, Tsch.) is, at most, three feet long, with a broad, heart-shaped head, and a thick upper lip. It haunts the higher forests, while in those lower down his place is filled by his no less fearful relative, the flammon, (*Lachesis rhombeata*, Prince Max.,) which is six or seven feet in length. These serpents are usually seen coiled almost in a circle, the head thrust forward, and the fierce, treacherous-looking eyes glaring around, watching for prey, upon which they pounce with the swiftness of an arrow; then, coiling themselves up again, they look tranquilly on the death-struggle of the victim. It would appear that these Amphibia have a perfect consciousness of the dreadful effect of their poisonous weapon, for they use it when they are neither attacked nor threatened, and they wound not merely animals fit for their food, but all that come within their reach. More formidable than the two snakes just described, but happily much less common, is the brown ten-inch-long viper (*Echidna ocellata*, Tsch.). It is brown, with two rows of black circular spots. The effect of its bite is so rapid that it kills a strong man in two or three minutes. So convinced are the natives of its inevitably fatal result, that they never seek any remedy: but immediately on receiving the wound lay themselves down to die. In the montanas of Pangoa this viper abounds more than in any other district: and never without apprehension do the cholos undertake their annual journey for the coca harvest, as they fear to fall victims to the bite of this viper. The warning sound of

the rattle-snake is seldom heard in the hot montanas, and never in the higher regions.

"Nature, who in almost all things has established an equilibrium, supplies the natives with remedies against the bite of the serpent. One of the cures most generally resorted to is the root of the amarucachu (*Polianthes tuberosa*,* Linn.), cut into slips and laid upon the wound. Another is the juice of the creeping plant called vijuco de huaco (*Mikania huaco*,† Kunth), which is already very widely celebrated.

"This latter remedy was discovered by the negroes of

* This is the Tuberose, a liliaceous plant, so commonly cultivated in our conservatories. It is generally stated to be a native of the East Indies, but the one spoken of by Tschudi, with a Peruvian name, must certainly be an indigenous plant of the country.

† The genus *Mikania* of Willdenow is one of the tubuliflorous *Asteraceæ*. *M. guaco* Humboldt mentions, under the name of Vijuco del Guaco, as being highly esteemed in South America as a valuable antidote against the bite of serpents. "Guaco" and "huaco" are the same word, the intensity of the aspirate varying among different peoples. The power of this *Mikania* is denied in the most positive terms by Hancock, who suspects that the real Guaco antidote is some kind of *Aristolochia*. The word "Vijuco" or "Bejuco," in Tropical America, signifies any climbing plant, and is equivalent to our florist word "creeper."

Eupatorium ayapana, belonging to the same order as *Mikania*, is a valuable repellent of the poison of venomous snakes. For this purpose it is used in Brazil. A quantity of the bruised leaves, which are to be frequently changed, is laid on the scarified wound, and some spoonfuls of the expressed juice are from time to time administered to the patient, till he is found to be free from the symptoms, especially the dreadful anxiety which follows the wounds of venomous reptiles. *E. perfoliatum* has a very similar action, and *Mikania opifera* is employed in the same way.—(*Lindley's Veg. Kingd.*, p. 707.) These facts tend to confirm the accuracy of Tschudi and Humboldt against Hancock.

the equatorial province Choco. They remarked that a sparrow-hawk, called the *huaco*, picked up snakes for his principal food, and when bitten by one it flew to the vejuco and ate some of the leaves. At length the Indians thought of making the experiment on themselves, and when bitten by serpents they drank the expressed juice of the leaves of the vejuco, and constantly found that the wound was thereby rendered harmless. The use of this excellent plant soon became general, and in some places the belief of the preservative power of the vejuco juice was carried so far that men in good health were inoculated with it. In this process some spoonfuls of the expressed fluid are drunk, and afterwards some drops are put into incisions made in the hands, feet, and breast. The fluid is rubbed into the wounds by fresh vejuco leaves. After this operation, according to the testimony of persons worthy of credit, the bite of the poisonous snake fails for a long time to have any evil effect. Beside the two plants mentioned above, many others are used with more or less favourable results. The inhabitants of the montana also resort to other means, which are too absurd to be detailed here: yet these medicines are often of benefit, for their operation is violently reactive. They usually produce the effect of repeated emetics and cause great perspiration. There is much difference in the modes of external treatment of the wound, and burning is often employed. I saw an Indian apply to his wife's foot, which had been bitten, a plaster consisting of moist gunpowder, pulverised sulphur, and finely-chopped tobacco mixed up together.

He laid this over the wounded part, and set fire to it. This application in connexion with one of the nausea-exciting remedies taken inwardly had a successful result.

An English officer, engaged in the wars which freed the South American republics from the Spanish dominion, thus speaks of a plant which is probably the same *Mikania*. His account is curiously confirmatory of the accuracy of Bruce:—

"Among the many medicinal and poisonous plants growing on the banks of the Orinoco, one of the most singular is a species of *vejuco*, which, when properly administered, proves a powerful preservative from the effects of poisonous serpents. It even appears to deprive these reptiles either of their power or inclination to use their fangs. Some of the leaves and small branches are pounded, and applied in that state as a cataplasm to both arms; the skin having been previously scarified freely above the elbows. This species of inoculation is repeated, at stated intervals; the juice of the bruised plant, diluted with water, being also occasionally drunk. Several soldiers, belonging to General Tedeno's division, had undergone this treatment, and frequently made the advantage they had thus acquired useful on a march. They were thereby enabled to take shelter in deserted huts, which we dared not enter on account of the snakes always lurking in such places; although these men could bring them out in their hands, without sustaining any injury. As they had been for some time in our company, we could ascertain that they had not any snakes in their possession

concealed for the purpose of deception. Besides, they could have little or no inducement to practice an imposition upon us, as they neither asked for, nor expected, any reward for exhibiting their skill in destroying these reptiles."*

According to Captain Forbes, the negroes of Dahomey employ a grass, or grass-like herb, with success. One of his hammock-men had been bitten by venomous snakes repeatedly, but, his father being a doctor, he had escaped injury. Walking one day through some long grass, the captain, pointing to the bare legs of his servant, asked if there was not danger. "None," said he; "my father picks some grass, and if on the same day the decoction is applied, the wound heals at once."†

Some animals, especially those which prey upon serpents, seem to be proof against their bites. The Ichneumons or Mangoustes of Africa and Asia have long been celebrated for their immunity, and veritable stories have been narrated of their having recourse to some herb, when bitten, after which they successfully renewed the attack. Percival, in his account of Ceylon, relates that a Mangouste placed in a close room where a venomous serpent was, instead of darting at it, as he would ordinarily have done, ran peeping about anxiously seeking some way of escape; but finding none it returned to its master, crept into his bosom, and could by no means be persuaded to face the snake. When, however, both were removed out of the

* *Campaigns and Cruises in Venezuela*, vol. i., p. 43.

† *Dahomey and the Dahomans.*

house into the open field, the Mangouste instantly flew at the serpent, and soon destroyed it. After the combat the little quadruped suddenly disappeared for a few minutes, and again returned. Percival concludes, not unreasonably, that during its absence, it had found the antidotal herb, and eaten of it. The natives state that the Mangouste resorts on such occasions to the *Ophiorhiza mungos*, whose root is reputed a specific for serpents' bites. This is a Cinchonaceous plant, so intensely bitter that it is called by the Malays by a name which signifies earth-gall.*

Captain Forbes in his interesting account of Dahomey, alludes to these combats, which he says he has witnessed in India. He says that the serpent (Cobra) has usually the advantage at first, but the Mangouste retreating, devours some wild herb, returns and presently conquers.

* Several of the *Aristolochiceæ*—plants generally having a very bitter taste, and a strong, pungent, disagreeable smell—are valuable alexipharmics. There is a plant very common in Jamaica, where it is called snake-withe, trailing over the stone fences, which I suspect to be an *Aristolochia*, and perhaps *A. trilobata*; it is employed as a sudden and potent sudorific, and as an antidote to serpent-bites in other countries, for in Jamaica there is no venomous reptile. The *A. anguicida* of Carthagena is described by Jacquin as fatal to serpents. He says that the juice of the root chewed and introduced into the mouth of a serpent so stupefies it that it may be for a long time handled with impunity: if the reptile is compelled to swallow a few drops, it perishes in convulsions. The root is also reputed to be an antidote to serpent-bites. "It is not a little remarkable," observes Dr Lindley, "that the power of stupefying snakes, ascribed in Carthagena to *Aristolochia anguicida*, should be also attributed to *A. pallida, longa, bœtica, sempervirens* and *rotunda*; which are said to be the plants with which the Egyptian jugglers stupefy the snakes they play with."

Sir Emerson Tennent inclines to refer the immunity of the Mangouste to an inherent property. He remarks that the mystery of its power has been "referred to the supposition that there may be some peculiarity in its organisation which renders it *proof against* the poison of the serpent. It remains for future investigation to determine how far this conjecture is founded in truth; and whether in the blood of the Mongoos there exists any element or quality which acts as a prophylactic. Such exceptional provisions are not without precedent in the animal economy: the hornbill feeds with impunity on the deadly fruit of the *Strychnos;* the milky juice of some species of *Euphorbia,* which is harmless to oxen, is invariably fatal to the zebra; and the tsetse fly, the pest of South Africa, whose bite is mortal to the ox, the dog, and the horse, is harmless to man and the untamed creatures of the forest." *

Our own hedgehog possesses the privilege of being unharmed by the venom of the viper, as is manifest in its frequent contests with it. Mr Slater has frequently seen combats between these animals, which always terminated in favour of the hedgehog. The latter seemed perfectly regardless of the many bites it received on the snout.†

To return to Bruce's statements. After describing the little horned viper of Egypt, the *Cerastes,* and its insidious manner of creeping towards its victim with its head averted, till within reach, when it suddenly springs and

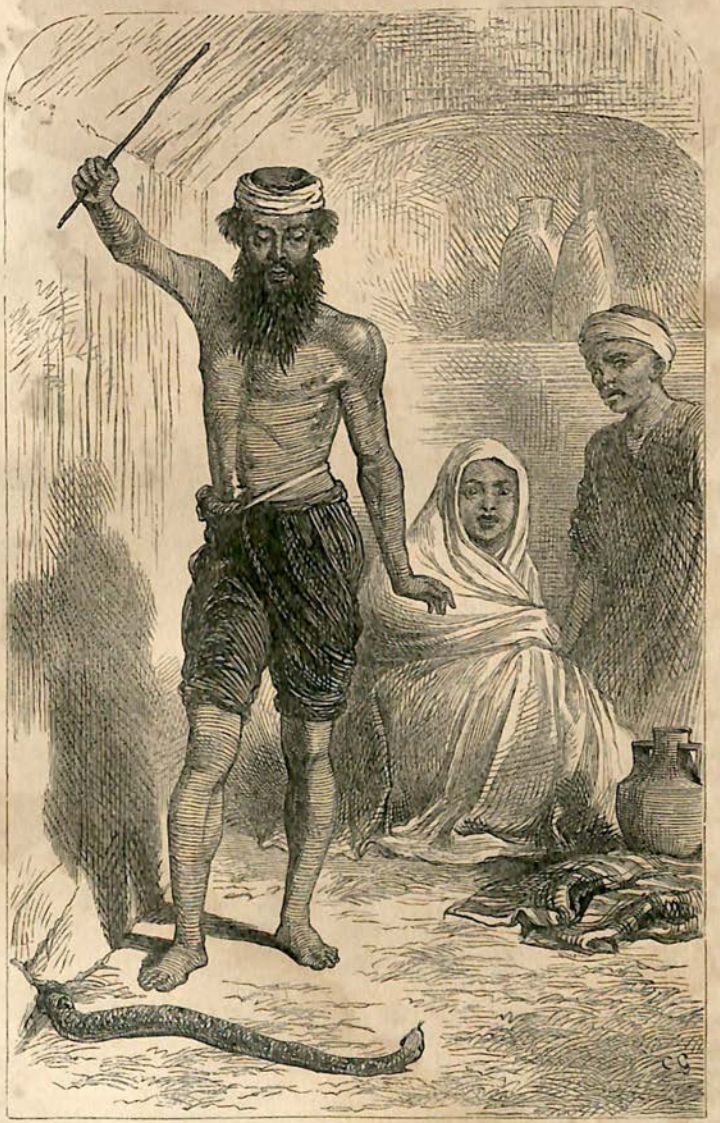
* *Ceylon,* i., 147.

† "On the Habits of the Viper in Silesia:" *Zoologist,* p. 829.

strikes, he goes on to say: "I saw one of them at Cairo crawl up the side of a box, in which there were many, and there lie still as if hiding himself, till one of the people who brought them to us came near him, and though in a very disadvantageous posture, sticking, as it were, perpendicularly to the side of the box, he leaped near the distance of three feet, and fastened between the man's forefinger and thumb, so as to bring the blood. The fellow shewed no signs of either pain or fear, and we kept him with us full four hours, without his applying any sort of remedy, or seeming inclined to do so.

"To make myself assured" (adds Bruce) "that the animal was in its perfect state, I made the man hold him by the neck, so as to force him to open his mouth and lacerate the thigh of a pelican, a bird I had tamed, as big as a swan. The bird died in about thirteen minutes, though it was apparently affected in fifty seconds; and we cannot think this was a fair trial, because a very few minutes before it had bit the man, and so discharged part of its virus, and it was made to scratch the pelican by force, without any irritation or action of its own.

"I will not hesitate to aver," he adds, "that I have seen at Cairo (and this may be seen daily without trouble or expense) a man, who came from above the catacombs, where the pits of the mummy-birds are kept, who has taken a Cerastes with his naked hand from a number of others lying at the bottom of the tub, has put it upon his bare head, covered it with the common red cap he wears, then taken it out, put it in his breast, and tied it about



SNAKE-CHARMING.

his neck like a necklace, after which it has been applied to a hen and bit it, which has died in a few minutes; and, to complete the experiment, the man has taken it by the neck, and beginning at its tail, has ate it, as one would do a carrot or a stock of celery, without any seeming repugnance." *

A few years earlier than Bruce, Hasselquist, an enthusiastic young naturalist, and one of the pupils of Linnæus, had visited the East. He paid much attention to the subject, and records his judgment that there is no delusion in serpent-charming, but that certain persons do really, in whatever way they effect it, fascinate serpents. "They take the most poisonous vipers with their bare hands, play with them, put them in their bosoms, and use a great many more tricks with them, as I have often seen. The person I saw on the above day had only a small viper, but I have frequently seen them handle those that are three or four feet long, and of the most horrid sort. I inquired *and examined* whether they cut out the viper's poisonous teeth: but *I have seen with my own eyes they do not:* we may therefore conclude, that there are to this day Psylli in Egypt; but what art they use is not generally known. Some people are very superstitious; and the generality believe this to be done by some supernatural art, which they obtain from invisible beings. I do not know whether their power is to be ascribed to good or evil; but I am persuaded that those who undertake it use many superstitions."

* *Trav. to the Sources of the Nile, passim.*

Subsequently we find some details of interest. "Now was the time (July) to catch all sorts of snakes to be met with in Egypt, the great heats bringing forth these vermin. I therefore made preparation to get as many as I could, and at once received four different sorts, which I have described and preserved in *aqua vitæ*. These were the Common Viper, the Cerastes of Alpin, the Jaculus, and an Anguis Marinus. They were brought me by a Psylle, who put me, together with the French consul, Sironcourt, and all the French nation present, in consternation.

"They gathered about us to see how she handled the most poisonous and dreadful creatures alive and brisk, without their doing or offering to do her the least harm. When she put them into the bottle where they were to be preserved, she took them with her bare hands, and handled them as our ladies do their laces. She had no difficulty with any but the *Viperæ officinales*, which were not fond of their lodging. They found means to creep out before the bottle could be corked. They crept over the hands and bare arms of the woman, without occasioning the least fear in her; she with great calmness took the snakes from her body, and put them into the place destined for their grave. She had taken these serpents in the field with the same ease she handled them before us; this we were told by the Arab who brought her to us. Doubtless this woman had some unknown art which enabled her to handle those creatures. It was impossible to get any information from her, for on this subject she would not open her lips."

He thus sums up the results of his investigations. "The circumstances relating to the fascination of serpents in Egypt stated to me, were principally:—

"1st.—That the art is only known to certain families, who propagate it to their offspring.

"2d.—The person who knows how to fascinate serpents, never meddles with other poisonous animals; such as scorpions, &c. There are different persons who know how to fascinate these animals; and they again never meddle with serpents.

"3d.—Those that fascinate serpents eat them both raw and boiled, and even make broth of them, which they eat very commonly amongst them; but in particular they eat such a dish when they go out to catch them. I have been told that serpents, fried or boiled, are frequently eaten by the Arabians, both in Egypt and Arabia, though they know not how to fascinate them, but catch them either alive or dead.

"4th.—After they have eaten their soup, they procure a blessing from their scheik, who uses some superstitious ceremonies, and, amongst others, spits on them several times with certain gestures."

The blessing of the priest, Hasselquist pronounces correctly enough to be mere superstition; we may fairly conclude that the eating of the snakes is also irrelevant,—both of these circumstances being calculated to increase popular wonder only, and to lead the observers from the true scent, which probably is the employment of preventive simples. Hasselquist had been told of a plant with

which the charmers anointed or rubbed themselves before they touched the serpents; but, as no such plant was produced to him, he regarded it as fabulous. We have seen reason, however, to conclude that the real key to the mystery lies there.*

The ancients believed that the human spittle was so fatal to serpents that much of the secret of charming lay in the knowledge of this fact. Of course this would make Psylli of all men; but there may be this measure of truth in the supposition, that the natural exudations of a human body which has been bathed or rubbed with a penetrating alexipharmic, may be so impregnated with the odour, as to be peculiarly repellent of the snake. Denham describes a scene of snake-charming in which the spittle played an important part. A juggler brought him in a bag two venomous snakes, which he set at liberty, beginning to beat a little drum. They immediately reared themselves on their tails, moving in a sort of dance. The juggler played various tricks with them, sometimes wreathing them round his neck, coiling them in his bosom, or throwing them among the people. On pointing his finger at their mouth, they immediately raised themselves in attitude to spring forward and strike; but after having exasperated them to the utmost, *he had only to spit in their face*, to make them retreat quite crest-fallen. From his description these seem to have been of the genus *Naia*, upwards of six feet long, and very venomous. The fangs, he says, had been ex-

* *Travels in the Levant, passim.*

tracted; but still, to guard against all possible injury, the fellow who played tricks with them had a large roll of cloth wound round the right arm.*

The influence of music on the serpents seems to be universally assumed as a part of the professional snake-charmer's success. The ancient Psylli who were employed to prevent the Roman camp from being troubled with venomous serpents, marched around it, chanting mystic songs. † Johnson describes the very clever snake-catchers of India as pretending to draw them from their holes by a song, and by playing a plaintive tune on an instrument somewhat resembling an Irish bagpipe. ‡ He says, indeed, that this is all delusion; but Forbes, in his "Oriental Memoirs," allows its reality. A learned native of India assured Sir William Jones that he had frequently seen the most venomous and malignant snakes leave their holes upon hearing notes from a flute, which, as he supposed, gave them peculiar delight.

The Egyptian snake-charmer assumes an air of mystery, strikes the walls with a short palm-stick, whistles, makes a clucking noise with his tongue, and says, "I adjure you, by God, if ye be above, or if ye be below, that ye come forth; I adjure you by the most great Name, if ye be obedient, come forth, and if ye be disobedient, die, die, die!" § The late Dr W. A. Bromfield, in some extracts from his letters published in the *Zoologist*, ‖ confirms

* *Discov. in Africa*, ii., p. 292.
‡ *Ind. Field Sports.*
‖ *Zool.*, 6400.
† *Lucan's Pharsalia.*
§ *Mod. Egyptians.*

this:—"The chief actor was a fine-looking man, with a handsome and intelligent, but peculiar cast of countenance. He carried a stick in his hand, with which, on entering each apartment, he struck the wall several times, uttering, in a low, measured tone, a form of exorcism in Arabic; adjuring and commanding the serpent—which he declared, immediately on the door being thrown open, was lurking in the walls or ceiling—to come forth. Presently, the reptile would be seen emerging from some hole or corner, with which every room, even in the better class of Egyptian houses, abounds; on which the enchanter would draw the unwilling serpent towards him, with the point of the stick, and when within reach put it in the bag he carried about with him for that purpose."

Chateaubriand has drawn a graphic picture of the power of music on the American Rattlesnake. The serpent happening to enter the encampment of his party in Canada, a Canadian who could play on the flute, advanced, by way of diversion, with his magic pipe, against it. On his approach the haughty reptile curled itself into a spiral line, flattened its head, inflated its cheeks, contracted its lips, displayed its envenomed fangs, and its bloody throat; its double tongue glowed like two flames of fire; its eyes were burning coals; its body, swollen with rage, rose and fell like the bellows of a forge; its dilated skin assumed a dull and scaly appearance; and its rattle, which sounded the denunciation of death, vibrated with extreme velocity. The Canadian now began to play upon his flute: the serpent started

with surprise, and drew back its head. In proportion as it was struck with the magic effect, its eyes lost their fierceness, the vibrations of its tail became slower, and the sound which it emitted gradually became weaker and ceased. The folds of the fascinated Serpent became less perpendicular upon their spiral line, expanded by degrees, and sunk one after another upon the ground, forming concentric circles. The colours recovered their brilliancy on its quivering skin; and, slightly turning its head, it remained motionless in the attitude of attention and pleasure. At this moment, the Canadian advanced a few steps, producing with his flute sweet and simple notes. The Reptile inclined its variegated neck, opened a passage with its head through the high grass, and began to creep after the musician, stopping when he stopped, and following him again as soon as he moved forward. In this manner, to the astonishment both of Europeans and natives, he was led out of the camp; and it was unanimously decreed, that the life of a creature so sensible of the concord of sweet sounds should be spared. *

Some allowance in the colouring of this picture, which must be allowed to be beautifully painted, may possibly be made to the poetical imagination of the narrator, for Chateaubriand could not tell a story without embellishing it *suo more*. We may, however, accept the main facts, confirmed as they are by the experience of other observers in other countries.

Mr Gogerly, a missionary of some standing in India

* *Beauties of Christianity.*

observes that some persons who were incredulous on the subject, after taking the most careful precautions against any trick or artifice being played, sent a charmer into the garden to prove his powers;—the man began to play upon his pipe, and proceeding from one part of the garden to another, for some minutes stopped at a part of the wall much injured by age, and intimated that a serpent was within. He then played quicker, and his notes were louder, when almost immediately a large Cobra di Capello put forth its hooded head, and the man ran fearlessly to the spot, seized it by the throat, and drew it forth. He then shewed the poison fangs, and beat them out; afterwards it was taken to the room where his baskets were left, and deposited among the rest. The snake-charmer, observes the same writer, applies his pipe to his mouth, and sends forth a few of his peculiar notes, and all the serpents stop as though enchanted; they then turn towards the musician, and approaching him within two feet raise their heads from the ground, and bending backwards and forwards, keep time with the tune. When he ceases playing, they drop their heads and remain quiet on the ground.

The *Penny Magazine* for April 1833, contains the following very precise and circumstantial narrative, communicated by a gentleman of high station at Madras:—"One morning, as I sat at breakfast, I heard a loud noise and shouting among my palankeen-bearers. On inquiry, I learned that they had seen a large hooded snake, and were trying to kill it. I immediately went out, and saw the snake creeping up a very high green mound, whence it

escaped into a hole in an old wall of ancient fortification; the men were armed with their sticks, which they always carry in their hands, and had attempted in vain to kill the reptile, which had eluded their pursuit, and in his hole had coiled himself up secure, whilst we could see his bright eyes shining. I had often desired to ascertain the truth of the report, as to the effect of music upon snakes. I therefore inquired for a snake-catcher. I was told there was no person of the kind in the village; but after a little inquiry, I heard there was one in a village distant about three miles. I accordingly sent for him, keeping a strict watch over the snake, which never attempted to escape, whilst we, his enemies, were in sight. About an hour elapsed, when my messenger returned bringing a snake-catcher. This man wore no covering on his head, nor any on his person, excepting a small piece of cloth round his loins; he had in his hands two baskets, one containing tame snakes, the other empty: these and his musical pipe were the only things he had with him. I made the snake-catcher leave his two baskets on the ground, at some distance, while he ascended the mound with his pipe alone. He began to play: at the sound of the music the snake came gradually and slowly out of his hole. When he was entirely within reach, the snake-catcher seized him dexterously by the tail and held him thus at arm's length; whilst the snake, enraged, darted his head in all directions, but in vain: thus suspended, he has not the power to round himself, so as to seize hold of his tormentor. He exhausted himself in vain exertions; when the snake-

catcher descended the bank, dropped him into the empty basket, and closed the lid: he then began to play, and after a short time, raised the lid of the basket; the snake darted about wildly, and attempted to escape; the lid was shut down again quickly, the music always playing. This was repeated two or three times; and in a very short interval, the lid being raised, the snake sat on his tail, opened his hood and danced quite as quietly as the tame snakes in the other basket, nor did he attempt again to escape. This, having witnessed with my own eyes, I can assert as a fact."

Experienced and skilful as these men are, however, they do not invariably escape with impunity. Fatal terminations to these exhibitions of the psyllic art now and then occur, for there are still to be found "deaf adders, which will not hearken to the voice of charmers, charming never so wisely." In Madras, a few years ago, a noted serpent-charmer chanced one morning to get hold of a Cobra of considerable size, which he got conveyed to his home. He was occupied abroad all day, and had not time to get the dangerous fangs extracted from the Serpent's mouth. This at least is the probable solution of the matter. In the evening he returned to his dwelling, considerably excited with liquor, and began to exhibit tricks with his snakes to various persons who were around him at the time. The newly-caught Cobra was brought out with the others, and the man, spirit-valiant, commenced to handle the stranger like the rest. But the Cobra darted at his chin, and bit it, making two marks like pin points.

The poor juggler was sobered in an instant. "I am a dead man," he exclaimed. The prospect of immediate death made the maintenance of his professional mysticism a thing of no moment. "Let the creature alone," said he to those about him, who would have killed the Cobra; "it may be of service to others who are of my trade. To me it can be of no more use. Nothing can save me." His professional knowledge was but too accurate. In two hours he was a corpse! The narrator saw him a short time after he died. His friends and brother jugglers had gathered around him, and had him placed on a chair in a sitting position. Seeing the detriment likely to result to their trade and interests from such a notion, they vehemently asserted that it was not the envenomed bite which had killed him. "No, no; he only forgot one little word—one small portion of the charm." In fact, they declared that he was not dead at all, but only in a sort of swoon, from which, according to the rules of the cabalistic art, he would recover in seven days. But the officers of the barracks, close to which the deceased had lived, interfered in the matter. They put a guard of one or two men on the house, declaring that they would allow the body to remain unburied for seven days, but would not permit any trickery. Of course the poor serpent-charmer never came to life again. His death, and the manner of it, gave a severe blow, as has been already hinted, to the art and practice of snake-charming in Madras.

Roberts also mentions the instance of a man who came to a gentleman's house to exhibit tame snakes, and on

being told that a Cobra, or Hooded Snake was in a cage in the house, was asked if he could charm it; on his replying in the affirmative, the Serpent was released from the cage, and, no doubt, in a state of high irritation. The man began his incantations, and repeated his charms, but the Snake darted at him, fastened upon his arm, and before night he was a corpse.

These failures, rare and abnormal as they confessedly are, do not by any means disprove the reality of snake-charming; they certainly shew that the men believe in their own powers. It may be, as some Europeans have maintained, that in India, the exhibitors usually practise upon tame snakes, from which they have already extracted the fangs, or even eradicated the poison sacs,—an operation performed without difficulty by making an incision beneath and behind each eye. Or it may be that the power of music over these reptiles is ordinarily relied on, and that in rare instances this fails. I have myself taken fierce and active lizards, in Jamaica, by a noose of string, while whistling a lively tune. As soon as the whistling commenced, the lizard would become still on the trunk or the branch of a tree, and so remain unmoved, with a sleepy look all the while I was searching up the string, preparing the noose, and presenting it to him, giving just a backward glance of his eye, as the noose slipped over his head, the whistling going on vigorously all the time, of course, till the cord being jerked tight, he suddenly found himself dangling in the air at the end of a stick, and began to wriggle and writhe, and scratch and bite furiously.

One thing seems clear from these accidents. The Indian *samp-wallahs* do not use any infusion or unguent to stupefy and disarm their snakes, as do those of Ethiopia. If these men just mentioned had been so protected they would not have been killed, however rash or pot-valiant they might have been. Indeed the accounts of Bruce and others of the African professors of the psyllic art, and the phenomena of the serpents acted upon, differ greatly from descriptions of parallel exhibitions in India, and suggest diverse modes of explanation.

A dozen years ago, there were a couple of oriental Psylli performing at the Zoological Gardens. Mr Brodcrip has given a very graphic sketch of their performance as he saw it in the Reptile House. The two Arabs took up their position on the floor, the company standing in a semicircle at a respectful distance.

"The old Arab said something to the young one, who stooped down. . . . and took out a large deal-box, drew off the cover, thrust in his hand and pulled out a large long *Naia haje* (the Egyptian species of Cobra). After handling it and playing with it a little while, he set it down on the floor, half squatted close to it, and fixed his eyes on the snake. The serpent instantly raised itself, expanded its hood, and turned slowly on its own axis, following the eye of the young Arab, turning as his head, or eye, or body turned. Sometimes it would dart at him, as if to bite. He exercised the most perfect command over the animal. All this time the old Arab stood still, pensively regarding the operation; but presently he also

squatted down, muttering some words, opposite to the snake. He evidently affected the reptile more strongly than his more mercurial relative, though he remained motionless, doing nothing that I could see but fixing his eyes upon the snake, with his face upon a level with the raised head of the serpent, which now turned all its attention to him, and seemed to be in a paroxysm of rage. Suddenly it darted open-mouthed at his face, furiously dashing its expanded whitish-edged jaws into the dark hollow cheek of the charmer, who still imperturbably kept his position, only smiling bitterly at his excited antagonist. I was very close, and watched very narrowly; but though the snake dashed at the old Arab's face and into it more than twice or thrice with its mouth wide open, I could not see the projection of any fang.

"Then the old Arab, who, it was said, had had the gift of charming serpents in his family for a long series of years, opened another box, and took out four or five great lizards, and provoked the Naia with them, holding them by the tails in a sort of four-in-hand style. Then the youth brought out a Cerastes, which I observed seemed overpowered, as if, as the country people say, something had come over it. He placed it on the floor; but this serpent did not raise itself like the Naia, but, as the charmer stooped to it, moved in a very odd, agitated manner, on its belly, regarding him askant. I thought the serpent was going to fly at the lad, but it did not. He took it up, played with it, blew or spit at it, and then set it down apparently sick, subdued, and limp. He then took it again,

played with it a second time, gathered it up in his hand, put it in his bosom, went to another box, drew the lid, and brought out more snakes, one of which was another Naia, and the others of a most venomous kind.

"Now there were two Naias, with heads and bodies erect, obeying, apparently, the volition of the charmers. One of the snakes bit the youth on the naked hand, and brought blood; but he only spat on the wound and scratched it with his nail which made the blood flow more freely. Then he brought out more lizards of a most revolting aspect. By this time the floor of the reptile house, that formed the stage of the charmers, began to put one in mind of the incantation-scene in *Der Freischutz*, only that the principal performers looked more like the Black Huntsman and one of his familiars than Max and Caspar, and the enchanters' circle was surrounded with fair ladies and their well-dressed lords, instead of the appalling shapes which thronged round the affrighted huntsman at the casting of the charmed bullets.

"The Arabs, holding the snakes by the tails, let their bodies touch the floor, when they came twisting and wriggling on towards the spectators, who now backed a little upon the toes of those who pressed them from behind. Sometimes the charmers would loose their hold, when the serpents, as if eager to escape from their tormentors, rapidly advanced upon the retreating ring; but they always caught them by the tails in time, and then made them repeat the same advances. I kept my position in front throughout, and had no fear, feeling certain that

Mr Mitchell, and those under whose superintendence this highly amusing and instructive establishment is so well conducted, would not have permitted the exhibition to take place, if there had been the least danger. Besides this, I observed that the charmers only used their own serpents, which they had, I presume, brought with them; and I confess that the impression upon my mind was, that they had been rendered innoxious by mechanical means."*

This last assumption the narrator subsequently found to be indubitably true. What is said of the *Cerastes*, however, looks more like the effect of something detrimental to the snake in the lad's odour, or in his spittle. Of course no confidence can be placed in their statements, but it is noteworthy that they both claimed to belong to a race over whom snakes have no morbific power,—Psylli, in fact, of many generations.

Dr Davy asserts that in India, however, the poison fangs are *not* extracted. He tells us that he has himself examined the snakes exhibited (which are always Cobras) and have found the fangs uninjured. He attributes the power of the charmers to their agility and courage, founded on an intimate acquaintance with the habits and disposition of the reptiles. The learned Doctor acting on this persuasion, says that he has himself repeatedly irritated these serpents with impunity. They can be readily appeased when irritated, by the voice and by gentle movements of the hand in a circle, and by stroking them on the body.

* *Note-book of a Naturalist*, 202.

A very curious subject, closely connected with serpent-charming, is the power of extracting venom from a wound inflicted by reptiles, attributed to the "snake-stone," which the Hindoos and Cingalese usually carry with them. Captain Napier thus describes it:—

"These people generally have for sale numbers of *snake-stones*, which are said to be equally an antidote against the bite of the serpent and the sting of the scorpion. For the former I have never seen it tried: and to prove its efficacy with the latter, the samp-wallah generally carries about in small earthen vessels a number of these animals, one of which he allows to wound him with his sting. The snake-stone, which is a dark, shining, smooth pebble, about the size and shape of a French bean, on being applied to the wound, instantly adheres to it, and by a power of suction appears to draw out the poison, which is supposed to be contained in the small bubbles which, on the immersion of the stone into a glass of water are seen in great numbers to rise to the surface.

"My first idea on beholding the samp-wallah allow himself to be stung by the scorpion was that the latter had by some means been rendered harmless. However, not wishing voluntarily to put this to the test by personal experience, I purchased some of the stones, resolved on the very first opportunity to try their efficacy. Shortly after this, happening to be marching up the country with a detachment, we pitched our camp on some very stony ground, in clearing which one of the English soldiers

happened to be bit [stung] in the hand by a large scorpion. As soon as I heard of this circumstance, I sent for the sufferer, who appeared to be in great pain, which he described as a burning sensation running all the way up his arm to the very shoulder.

"I applied one of the snake-stones to the puncture; it adhered immediately, and during about eight minutes that it remained on the patient, he by degrees became easier; the pain diminished, gradually coming down from the shoulder, until it appeared entirely confined to the immediate vicinity of the wound. I now removed the stone; on putting it into a cup of water, numbers of small air-bubbles rose to the surface, and in a short time the man ceased to suffer any inconvenience from the accident." *

It is scarcely needful to say that the emission of bubbles is a most ordinary phenomenon, and could have not the slightest connexion with the alexipharmic power of the stone, whether real or imaginary. Any one may see exactly the same thing on dropping a bit of new flower-pot, or a very dry brick into water, or any other substance heavier than the fluid, which is at the same time dry and porous. It results from the air which is contained in the pores of the material, which on immersion is displaced by the heavier water, and rises in oozing bubbles to the surface.

Sir Emerson Tennent has some observations of much value on these "stones," as well as on cognate matters,

* Napier's *Scenes and Sports*, vol. ii., p. 227.

which my readers may like to see, and with which I close this subject:—

"On one occasion, in March 1854, a friend of mine was riding, with some other civil officers of the government, along a jungle-path in the vicinity of Bintenne, when they saw one of two Tamils, who were approaching them, suddenly dart into the forest and return, holding in both hands a *cobra di capello* which he had seized by the head and tail. He called to his companion for assistance to place it in their covered basket, but in doing this, he handled it so inexpertly that it seized him by the finger, and retained its hold for a few seconds, as if unable to retract its fangs. The blood flowed, and intense pain appeared to follow almost immediately; but, with all expedition, the friend of the sufferer undid his waistcloth, and took from it two snake-stones, each of the size of a small almond, intensely black and highly polished, though of an extremely light substance. These he applied one to each wound inflicted by the teeth of the serpent, to which the stones attached themselves closely, the blood that oozed from the bites being rapidly imbibed by the porous texture of the article applied. The stones adhered tenaciously for three or four minutes, the wounded man's companion in the meanwhile rubbing his arm downwards from the shoulder towards the fingers. At length the snake-stones dropped off of their own accord; the suffering appeared to have subsided; he twisted his fingers till the joints cracked, and went on his way without concern. Whilst this had been going on, another Indian of the

party who had come up took from his bag a small piece of white wood, which resembled a root, and passed it gently near the head of the cobra, which the latter immediately inclined close to the ground; he then lifted the snake without hesitation, and coiled it into a circle at the bottom of his basket. The root, by which he professed to be enabled to perform this operation with safety, he called the *Naya-thalee Kalinga* (the root of the snake-plant,) protected by which he professed his ability to approach any reptile with impunity. In another instance, in 1853, Mr Lavalliere, the District Judge of Kandy, informed me that he saw a snake-charmer in the jungle, close by the town, search for a *cobra di capello*, and, after disturbing it in its retreat, the man tried to secure it, but, in the attempt, he was bitten in the thigh till blood trickled from the wound. He instantly applied the *Pamboo-Kaloo* (or snake-stone), which adhered closely for about ten minutes, during which time he passed the root which he held in his hand backwards and forwards above the stone, till the latter dropped to the ground. He assured Mr Lavalliere that all danger was then past. That gentleman obtained from him the snake-stone he had relied on, and saw him repeatedly afterwards in perfect health. The substances which were used on both these occasions are now in my possession. The roots employed by the several parties are not identical. One appears to be a bit of the stem of an *Aristolochia;* the other is so dry as to render it difficult to identify it, but it resembles the quadrangular stem of a jungle vine. Some species of *Aristolochia*, such as the

A. serpentaria of North America, are supposed to act as a specific in the cure of snake-bites; and the *A. Indica* is the plant to which the ichneumon is popularly believed to resort as an antidote when bitten; but it is probable that the use of any particular plant by the snake-charmers is a pretence, or rather a delusion, the reptile being overpowered by the resolute action of the operator, and not by the influence of any secondary appliance, the confidence inspired by the supposed talisman enabling its possessor to address himself fearlessly to his task, and thus to effect by determination and will, what is popularly believed to be the result of charms and stupefaction."

The writer then alludes to the facts mentioned by Bruce, which I have before adduced; and proceeds:—

"As to the snake-stone itself, I submitted one, the application of which I have been describing, to Mr Faraday, and he has communicated to me, as the result of his analysis, his belief that it is 'a piece of charred bone which has been filled with blood perhaps several times, and then carefully charred again. Evidence of this is afforded, as well by the apertures of cells or tubes on its surface as by the fact that it yields and breaks under pressure, and exhibits an organic structure within. When heated slightly, water rises from it, and also a little ammonia; and, if heated still more highly in the air, the carbon burns away, and a bulky white ash is left, retaining the shape and size of the 'stone.' This ash, as is evident from inspection, cannot have belonged to any vegetable substance, for it is almost entirely composed of phosphate

of lime. Mr Faraday adds that 'if the piece of matter has ever been employed as a spongy absorbent, it seems hardly fit for that purpose in its present state; but who can say to what treatment it has been subjected since it was fit for use, or to what treatment the natives may submit it when expecting to have occasion to use it?'"

Sir E. Tennent supposes that the animal charcoal may be sufficiently absorbent to extract the venom from the recent wound together with a portion of the blood, before it has had time to be carried into the system. If this be so the process is analogous to that of sucking a poisoned wound, already referred to.*

What the author means by a jungle vine I do not exactly know, but conjecture that it may be one of the *Bignoniaceæ*, the woody climbing species of which have in general their stem divided into lobes arranged in a quadrangular manner. I am not aware that any species of this order is an antidote to animal poisons, but many have powerful medicinal properties, and abound in bitter juices. The whitewood of Jamaica (*Bignonia leucoxylon*) enjoys a reputation as a remedy for the poison of the Manchineel (*Hippomane mancinella*) which is so virulent that persons are reported to have been killed by its volatile emanations, when accidentally sleeping under its shade, and a drop of its juice falling on the skin burns it like fire, and produces an ulcer difficult to heal. The value of the *Aristolochia* has been already referred to; and on the whole I am disposed to attach more importance to the

* Tennent's *Ceylon*.

use of vegetable specifics by the Ceylonese operators than the learned author whom I have just quoted. The subject is a highly curious one, and well worthy of minute investigation by able and unprejudiced men of science, willing to receive unscientific information and suggestions, in various parts of the world, particularly in the intertropical regions of both hemispheres.

X.

BEAUTY.

VERY much of the delight with which we pursue natural history is surely due to the almost constant recognition of the beautiful. I do not know that I could say with the poet,—

"A thing of beauty is a joy *for ever;*"

but certainly it is a joy as long as it endures; and the naturalist finds an endless recurrence of things of beauty. Birds, insects, shells, zoophytes, flowers, sea-weeds, are all redundant of beauty; and all the classes of natural objects, though not in an equal degree, nor manifestly in every individual object, yet possess it as a prominent element. Indeed, from the profusion with which loveliness is sown broadcast over the works of God, I have often thought, though it is not directly revealed, that a sense of the beautiful and a complacency in it, altogether independent of fitness for certain ends, or the uses which may be subserved, is an attribute of the Holy One Himself, and that our perception of it is the reflection of His—a part of that image of God in which man was created, and which sin has not wholly obliterated. I know that God may have clothed His works with beauty for other admir-

ing eyes than man's; and that it is probable that the holy angels may be far more conversant with creation than we are with all our researches,—that the ten thousand times ten thousand flowers which are "born to blush unseen" by *man*, may be seen and admired by "ten thousand times ten thousand" angels,* and thus the tribute of praise for their perfection may be ever ascending before Him whose hands made them for His glory. We may allow this; and yet with reverence presume that His own pure eyes look upon the lilies' array with a delight in their mere loveliness, infinitely greater than that which men, or even angels, take in it, seeing it is written,—"for thy pleasure they are, and were created."

I remember being struck, and somewhat awed, too, with a thought of this kind, once, when, pushing my way through a very dense and tangled thicket in a lone and lofty mountain region of Jamaica, sufficiently remote from the dwellings of man to render it probable that no civilized human foot had penetrated thither before. I suddenly came upon a most magnificent terrestrial orchid in full blossom. It was *Phajus Tankervilliæ*,—a noble plant, which from the midst of broad leaves growing out of a mass of green bulbs, had thrown up its stout blossom-stems to the height of a yard or more, crowned with the pyramidal spike of lily-like flowers, whose expanding petals of pure white on one side and golden brown on the other, and trumpet-lip of gorgeous purple seemed, to my ravished gaze, the very perfection of beauty. For ages, I thought.

* Rev. v. 11.

that beauteous flower had been growing in that wild and unvisited spot, every season "filling the air around with beauty," and had in all probability never met a single human gaze before. Had, then, all that divinely-formed loveliness been mere waste for those generations? I asked myself; and I immediately replied, No: the eye of God himself hath rested on it with satisfaction, and the Lord hath taken pleasure in this work of His hands.

I shall not make this chapter an essay on the sublime and beautiful, nor seek to analyse the sense of beauty. It is enough that it is an appetite of our being, and that most abundantly in nature, on every side, there is the material of its gratification. So abundantly, indeed, that it were easy to expand the few pages which I propose to devote to the subject into a volume, or a dozen volumes, and yet leave untouched vast treasures of the beautiful in natural history. I must content myself and my readers with the selection of a few of the more prominent objects in which this sense is gratified, and with a discrimination of two or three distinct phases or conditions of existence which contribute, each in its measure, to give delight to the eyes.

Among Quadrupeds, there is perhaps less of beauty, strictly considered, than in most other classes of animals. Elegance of form, however, which is one phase of it, is seen in the lithe and active squirrel, the pretty petaurist, and many other of the smaller beasties, and is found in perfection in the deer and antelopes. Who that has seen a pet fawn coming to be caressed by a fair girl, but must have had his sense of the beautiful gratified? Mark the

ANTELOPES.

freedom and grace of every motion? See how it stretches out its pretty meek face and taper neck towards the hand; its extreme timidity causing its whole body and every limb to start on the slightest stir from the beholders, while on the least approach it bounds away in the exuberant playfulness of its little heart, then stops, and turns, and gazes, and stretches out its neck again! See when it trots or walks, how high it lifts its little slender feet, bending its agile limbs as if motion itself were a pleasure! See, as it stands, with one fore-foot bent up, the hoof nearly touching the belly; the long graceful ears moving this way and that, now thrown forwards, now backwards, now erected, to catch the slightest sound,—what a picture of fairy grace it is! There is beauty, too, in the soft, full liquid eye of these animals,—the "bright, black eye" of the "dear gazelle," which in the East is the very ideal of female loveliness. Its melting gaze seems full of tenderness, so that we cannot look without loving it.

Nor is beauty of colour wholly wanting. How rich is the tawny fur of the tiger, dashed with its black streaks! And the brighter yellow of the leopard and the jaguar, studded all over with rosettes of black spots! We forget the ferocity of the savage in its beautifully-painted coat. The zebra, too,—with the fine contrast of those bands of richest sable on the cream-coloured ground, now bold and broad, as on the rounded body, now running in fine parallel but irregularly-waved lines, as on the face,—is a beautiful quadruped; and a herd of them galloping wan-

tonly over a South African plain, must be a sight worth seeing indeed.

When we come to Birds, however, beauty is not the exception, but the rule. The form of a bird is almost always graceful; the rounded swellings and undulations of outline, and the smoothness of the plumage give pleasure to the eye, even when there is no attractiveness of hue. One has almost a difficulty in naming an inelegant bird. But when, as in a thousand instances, brilliancy of colouring is combined with elegance of shape and smoothness of plumage, we must be charmed. Is not our own little goldfinch, is not the pert chaffinch that comes up to our very feet for a grain or a crumb, a pretty object? But the tropical birds,—we must look at them if we wish to know what nature can do in the way of adornment. We should go to the flats on the embouchure of the Amazon, and see the rosy spoonbills, in their delicate carnation dress, set off by the lustrous crimson of their shoulders and breast-tufts, feeding by hundreds on the green mud, or watch the gorgeous ibises, all clad in glowing scarlet with black-tipped wings, when, in serried ranks, a mile in length, like the vermillion cloud of morning, they come to their breeding-place,—a truly magnificent sight.*

The first of the Parrot tribe that I ever had an opportunity of seeing in its native freedom was the beautiful Parrakeet of the Southern States. Eighty or a hundred birds in one compact flock passed me flying low, and all

* Edwards's *Voyage up the Amazon*, 194.

nearly on the same plane; and, as they swept by, screaming as they went, I fancied that they looked like an immense shawl of green satin, on which an irregular pattern was worked in scarlet and gold and azure. The sun's rays were brilliantly reflected from the gorgeous surface, which rapidly sped past like a splendid vision.

The Cock of the Rock is a fine South American bird of the richest orange colour, crowned with a double crest of feathers edged with purple. Mr Wallace describes his search for it on the Rio Negro, and his admiration of its beauty. Some time he sought in vain, for it is a rare bird, till the old Indian who was his guide suddenly caught him by the arm, and, pointing to a dense thicket, whispered in a low tone, "Gallo!" Peering through the foliage, the naturalist caught a glimpse of the magnificent bird, sitting amidst the gloom, and shining out like a mass of brilliant flame. As it is easily alarmed and very wary, it required some following and perseverance before he shot it. One of his Indians descended into the deep rocky glen into which it fell, and brought it to him. "I was lost," he says, "in admiration of the dazzling beauty of its soft downy feathers; not a spot of blood was visible, not a feather was ruffled, and the soft, warm, flexible body set off the fresh swelling plumage in a manner which no stuffed specimen can approach." *

There is something exquisitely pleasing to the eye in the delicate painting of the soft plumage in most of the Goatsuckers and their allies. Entirely destitute of bril-

* *Travels on the Amazon and Negro*, 222.

liant hues as they are, the combinations of warm browns, and cool greys, interchanged with black and white, and the manner in which these are softened, and blended, and minutely pencilled, produce an effect that is peculiarly charming.

In the Trogons of the tropical regions we see elegance of form combined with the most gorgeous colouring. Green and gold, crimson, scarlet, orange, and black, are the hues of these birds, which hide themselves in the deep dark recesses of the Amazonian and Indian forests. That species called the Resplendent is the noblest of the race, whose magnificence was so well appreciated by the ancient Mexican emperors, that none but members of the royal family were permitted to adorn themselves with its flowing plumes. The whole upper parts of this bird, its fine coronal crest of erectile plumes, its shoulder-hackles, or long lance-shaped feathers, that droop over the sides, and the elongated tail-coverts which hang down beyond the tail to a length of three feet or more, curving elegantly under the bird, as it sits on a branch, are of the richest golden green, shining with a satiny radiance. The under parts are of a splendid scarlet, and the tail feathers are white, with broad black bars.

More enchanting than mere colour, however rich and glowing this may be, is the fine metallic reflection which we see on the plumage of many tropical birds. The Rifle-bird of Australia might be seen sitting on a tree, and be passed by with contempt as a mere crow, while the eye was attracted to a more gaily-hued parrot by its side.

But viewed close at hand, in the full blaze of the sun, the darker-plumaged bird is seen to exceed the other by far, in gorgeous glory, and to be not unworthy of the specific title of *Paradiseus*, by which it is known to naturalists. The body generally is of a deep velvet black, but it reflects a purple flush on the upper parts, and the feathers of the under parts are edged with olive-green. The crown of the head, and the whole throat, are clothed with scale-like feathers of the brightest emerald-green, which blaze with a gemmeous lustre, in certain lights, and make the most vivid contrast with the velvet of the body. The tail displays its two middle feathers of the same lustrous green, while the bordering ones are deep black.

The vast and little-known island of Papua contains some specimens of the feathered race of surpassing glory. The *Epimachi*, or Plume-birds, take a prominent place in this category. They are remarkable for the erectile scale-like feathers of the sides and shoulders, which form large fan-shaped tufts, standing out from the body in a very striking manner. Speaking of the superb Epimachus, Sonnerat, its describer, thus writes:—"As if to add to the singularity of this bird, nature has placed above and below its wings feathers of an extraordinary form, and such as one does not see in other birds; she seems, moreover, to have pleased herself in painting this being, already so singular, with her most brilliant colours. The head, the neck, and the belly are glittering green; the feathers which cover these parts possess the lustre and softness of velvet to the eye and touch; the back is changeable violet;

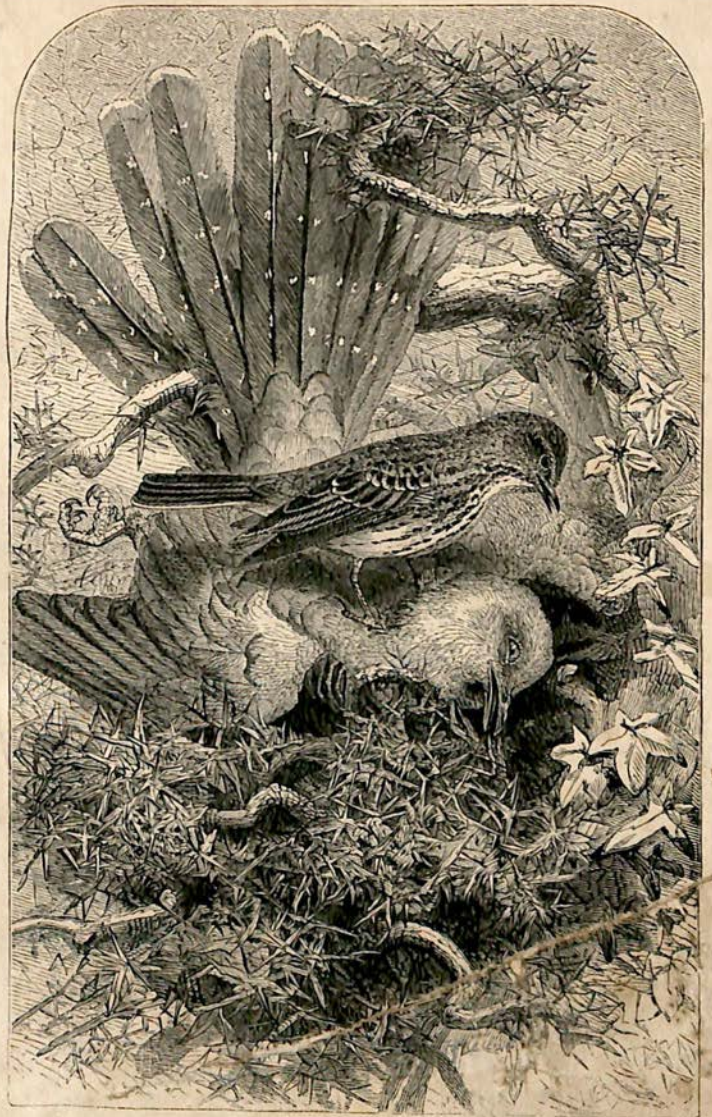
the wings are of the same colour, and appear, according to the lights in which they are held, blue, violet, or deep black; always, however, imitating velvet. The tail is composed of twelve feathers, the two middle feathers are the longest, and the lateral feathers gradually diminish; it is violet, or changeable blue above, and black beneath. The feathers which compose it are as wide in proportion as they are long, and shine above and below with the brilliancy of polished metal.

"Above the wings the scapularies are very long and singularly formed; their points being very short on one side, and very long on the other. These feathers are of the colour of polished steel, changing into blue, terminated by a large spot of brilliant green, and forming a species of tuft or appendage at the margin of the wings.

"Below the wings spring long curved feathers, directed upwards; these are black on the inside, and brilliant green on the outside. The bill and feet are black."*

The same author, in referring to the brilliant metallic hues of this and other birds, takes occasion to notice the iridescent effect which is produced by the different angle at which light falls on the feathers. The emerald-green, for instance, will often fling out rays of its two constituent primary colours, at one time being blue-green, at another gold-green, while in certain lights all colour vanishes, and a velvet-black is presented to the eye. The ruby feathers of several birds become orange under certain lights, and darken to a crimson-black at other times.

* *Voy. à la Nouv. Guinée.*



MOURNING THE DEAD CUCKOO

This change of hue is analogous to the well-known iridescent changeableness of the nacre which lines various shells, and is owing to the structure of its surface reflecting the light in different rays, according to the angle at which it falls upon the feathers.

Another species, a native of the same teeming region, the Twelve-thread Epimachus, glows, with equal lustre, in the richest violet and emerald, but somewhat diversely arranged. The long, elegant depending tail is here reduced to ordinary dimensions, but, as if to compensate for this inferiority, the Twelve-thread is adorned with an expanding dress of the purest snowy white, composed of long silky plumes that spring from behind and below the wings, so soft and so loosely webbed as to wave gracefully in the slightest breeze. From these tufts project long and very slender shafts, unwebbed, and as fine as threads, curling elegantly, six on each side.

The little Sun-birds of India and Africa, and the still tinier Humming-birds of the New World are conspicuous for the metallic radiance of their plumage. Take for an example of the former the Fire-tailed Sun-bird of Nepâl. The crown and forehead are brilliant steel-blue, while the neck, the back, and the rump are of the richest scarlet, diversified by a broad patch of bright yellow across the middle of the back. The central feathers of the tail are lengthened, and are bright scarlet, while the lateral feathers are edged with the same rich hue on brown. The breast is golden yellow or orange, flushed with crimson in the centre, and the rest of the inferior parts

are olive-green. Most of those gorgeous colours have a silky or metallic lustre, and blaze out under the tropical sunlight with amazing brightness.

Exquisite ornaments are these to an Indian garden, where they delight in the flowering plants and shrubs. They creep to and fro about the stalks and twigs, clinging by their little purple feet, and rifling the tubular corollas of the honeyed blossoms, whence doubtless they gather many minute insects, licked up with the nectar, by the aid of their curiously pencilled tongue.

For that peculiar charm which resides in flashing light combined with the most brilliant colours, the lustre of precious stones, there are no birds, no creatures, that can compare with the Humming-birds. Confined exclusively to America,—whence we have already gathered between three and four hundred distinct species, and more are being continually discovered,—these lovely little winged gems were to the Mexican and Peruvian Indians the very quintessence of beauty. By these simple people they were called by various names signifying "the rays of the sun," "the tresses of the day-star," and the like. Their glittering scale-like plumage was employed to make, at the cost of immense time, patience, and labour, the radiant mantles in which the emperors and highest nobles appeared on state occasions, as well as to form by a sort of mosaic, those embroidered pictures which so attracted the admiration of the Spanish conquerors. The Mexican priests adopted the tiny birds into their mythology: they taught that the souls of those warriors who died in defence of the

gods, were conducted by Toyamiqui, the wife of the god of war, straight to the mansion of the sun, and there transformed into humming-birds.

In the gorgeous forest glooms of the mountainous parts of Jamaica, and especially in the sunny glades which here and there break their uniformity, where the ever-verdant foliage rises upon all sides of the open space like a wall, covered with the most elegant and fragrant flowers, I have been charmed by the familiar fearlessness and lustrous splendour of these little creatures. Here sitting down on a prostrate log in the shadow, I have watched them sipping all around, flitting to and fro, coming and going, every moment disappearing in the sombre shade, or suddenly flashing out, with a whirr like that of a spinning-wheel, into the bright sunshine. Bold and unsuspecting, they might be seen exploring bush after bush, and coming, while I remained motionless, even within arm's length of me, busily rifling all the blossoms in rapid succession, regularly quartering the surface of some favourite shrub, so as to lose none, and of course, in their zeal, frequently probing the same flower again and again. Sometimes it would be the Mango, suspending himself on whirring pinions in front of the flowers, his broadly-expanded tail-feathers of the richest violet, his body plumage all green and gold, and his cheeks and throat blazing, in the changing light, with the radiance now of the ruby, now of the amethyst, now of the sapphire, and now becoming for an instant the most intense black. But much more commonly on these occasions was I visited by the elegant

Long-tail, whose slender form, black velvet crest, emerald bosom, and long tail-plumes, distinguish it as one of the *principes* of this patrician race. This lovely little gem would be hovering about, half-a-dozen visible at the same moment, threading the projecting branches, now probing here, now there, one moment above a flower and bending down to it, the next hanging below it, and thrusting up its crimson beak to kiss its nectar-tube from beneath, the cloudy wings on each side vibrating with a noise like that of a factory wheel, and its entire throat, breast and belly clothed in scaly plumage of the richest green, contrasted finely with the velvety black of all beside. This scaly plumage would flash brilliantly back the sun's light, like a noble emerald in the crown of a king; then, by the slightest possible turn of the bird, it would become black, all the light being absorbed; then, on another movement, it would seem a dark rich olive, and in an instant flame forth again with emerald effulgence, over which olive and black clouds were momentarily passing and repassing.

The phenomenon of this changing lustre is worthy of more careful attention than it has received. In such Humming-birds as I have examined,—and possibly it may be a general rule,—the iridescence of those portions of the plumage that are changeable is splendid in the ratio of the acuteness of the angle formed by the incident ray and the reflected one. Thus the scaly plumage of the neck of the Mango appears to advantage in a room with a single window, only when the beholder stands with his back to the light, and has the bird before him and facing

him. Then the perpendicular band down the throat and breast, which seems composed of the richest black velvet, is bounded on each side by a broad band of glowing crimson, mingled with violet. It is not the *entire* plumage of even a Humming-bird that displays these refulgent gleams: some of the brilliant hues are permanent, not changeable colours; such as the golden greens which adorn the back and wing-coverts in so many species; in which the colour is subject to little change, and the only effect produced by the alteration of the angle of the light is the transforming the tips of the feathers into the appearance of burnished gold.

Wilson * has remarked that the plumage of the Indigo finch (*Fringilla cyanea*) in certain lights appears of a rich sky-blue and in others of a vivid verdigris green, so that the same bird, in passing from one place to another before your eyes, seems to undergo a total change of colour. When the rays of light so fall on the plumage that the angle of the incident and reflected ray is acute, the colour is green, when obtuse, blue. I have myself noticed exactly the same thing in the brilliant changeable colour of insects,—as, for instance, the *Cicindelæ* of America, and the Emerald Virgin Dragonfly (*Agrion Virginica.*)

To return, however, to our Humming-birds, of which my readers will like to have one or two more described,—*la crême de la crême*, the very *élite* of this lovely little fairy population. If we were to cross the Atlantic to

* *Amer. Ornith.*

Brazil, track up the mighty Amazon some thirty days' sail, and a distance of a thousand miles, we should come to the mouth of the Rio Negro, where a remarkable change in the appearance of the water indicates a totally different region. Instead of the muddy water of the Amazon, resembling pea-soup, that of the Negro is intensely dark, but clear and limpid, every ripple sparkling like crystal. The land becomes high, and the river, some four miles wide, passes between lofty cliffs, crowned with the rich green walls of the primeval forest. The country is far more attractive than that on the Amazon; instead of a dead level, swampy and intersected by sluggish *igaripés*, or shallow ponds, overhung by impenetrably tangled thickets, and full of venomous flies, here are gentle hills, and tiny brooks of sparkling water, and a comparatively open forest, with bright clear glades in which the traveller may recline without persecution from the flies,—these pests being unknown on the "black waters." The ground is covered by evergreens of different species and exquisite forms, and many kinds of elegant ferns are growing in the valleys. There are few lianes or spinous briers stretching from tree to tree, obstructing free passage, but a thousand lesser vines drape the low tree tops with myriads of flowers, new and attractive to the visitor. Everywhere the forest is intersected by paths, some made by the inhabitants in their frequent rambles, others by wild animals that come to the water to drink; and along these the eager naturalist can readily pass to the feeding trees of many beautiful and peculiar birds.

Here are wont to haunt many varieties of the richly-hued trogons, unknown to the lower regions; and at any hour their plaintive note may be heard at intervals, as they sit moodily, singly or in pairs, on the branches, with the long tail outspread and drooping, watching for passing insects. Cuckoos of several kinds, their plumage glancing red in the subdued light, flit noiselessly through the woods, searching for caterpillars. Purple jays, in large flocks, alight on some berry-bearing tree, chattering and gesticulating, but shy and alert,—ready to start at the snapping of a twig. Motmots and chatterers in gayest hues,—scarlet, violet and blue,—are abundant. Goatsuckers, in exquisitely-blended and pencilled tones of colour, start from some shady glen where they are dozing away the day hours, and, flying a short distance on soft winnowing pinions, rest again, and seem to fall asleep in an instant. Showy manikins and tanagers of the brightest tints are flaunting in every bush: pigeons and doves of soberer hues are cooing their gentle complainings in the taller trees; and guans and curassows are marching with stately pace in the paths, picking here and there some delicate morsel; or running with loud harsh cry, with outstretched neck and rapid stride, as they detect approaching danger.*

Still, conspicuous above all are the Humming-birds, which, revelling in this region of the sun, are buzzing around the blossoming shrubs like insects. And pre-eminent among these is the Fiery Topaz, a name that attempts to express what neither title, nor description,

* Edwards's *Voy. up the Amazon*, 143.

nor coloured figure can adequately express,—its gemmeous magnificence and lustre. One of the first ornithologists of the age, the Prince of Canino, has assigned to the species the honour of being "*inter Trochilides pulcherrimus.*" Description, however, I must give, for want of anything better, since, even if I possessed a living specimen, I could not exhibit its living radiance to all my readers: therefore, pray pay attention to the details, and imagine. The general hue of this imperial atom is a blazing scarlet, in fine contrast with which the head and lower part of the throat are deep velvet-black. The gorget of the throat is emerald green, with a cloud of delicate crimson in the centre. The lower part of the back, the rump and the upper tail-coverts are of that beautiful bronzed green which changes to orange gold, so frequently seen in this tribe; while the wing-quills and tail are purplish black, except the middle pair of feathers in the latter, which are very slender, project to a great length, and cross each other; these are green with a purple gloss.

Among the hundreds of species of this very lovely tribe that swarm in the intertropical regions of South America, I will select one more for its surpassing beauty. It is the Bar-tailed Comet. We must look for it in the temperate and equable valley of the Desaguedero, which leads out of Lake Titiçaça, the largest sheet of water on the South American continent, and famous in Peruvian tradition, as the scene where Mango Capac and Mama Ocollo surprised the barbarous aborigines by their first

appearance. On one of the charming islets of this quiet lake, the two august strangers were seen, clothed in garments; and, declaring that they were the children of the sun long prophesied of, proceeded to teach their simple subjects the arts of civilisation, and to establish a regular government. We must search for our tiny Comet, too, in the cultivated plains that surround the Cerro of Potosi, that singular cone sixteen thousand feet in height, which is wholly composed of silver, and which is estimated to have yielded, during the three hundred years that have elapsed since the Indian exposed the solid silver, when he accidentally tore up a shrub by the roots,—the sum of two hundred millions of pounds sterling. The districts around, and specially the environs of the town of Chuquisaca, are adorned with a profusion of gardens and orchards, in which many European trees and flowers grow, as well as those of the tropics, the climate possessing the charms of many regions. In the shrubberies of the city, and in the gardens of the Indian cottages, as well as the slopes of the surrounding mountains, where the native groves and forests grow undisturbed, the brilliant Bar-tail may be seen during the summer months; but, as soon as the chilling winds of April tell of coming winter, the charming visitor becomes scarce, and flitting northward finds in the forests of Lower Peru the mild and balmy air which he loves. When the trees are in blossom, and particularly the apple-trees, which have been introduced from Europe, and are largely cultivated in orchards, the males may be seen shooting in and out among the foliage, like glowing

coals of fire, chasing each other with shrill chirpings, and with surprising perseverance and acrimony. The fields of maize, and pulse, and other leguminous plants which are cultivated in the plains, receive a fair share of his attention; and the nopâleries, or cactus-gardens, where the cochineal insect is reared for those most valuable crimson and scarlet dyes, which far outshine the vaunted productions of ancient Tyre. The blossom of the nopâl is itself one of the most splendid of flowers. It begins to open as the sun declines, and is in full expanse throughout the night, shedding a delicious fragrance, and offering its brimming goblet, filled with nectareous juice, to thousands of moths, and other crepuscular and nocturnal insects. When the moon is at the full in those cloudless nights whose loveliness is known only in the tropics, the broad blossom is seen as a circular disk nearly a foot in diameter, very full of petals, of which the outer series are of a yellowish hue, gradually paling to the centre, where they shine in the purest white. The numerous recurving stamens surround the style which rises in the midst like a polished shaft, the whole glowing in its silvery beauty under the moonbeams, from the dark and matted foliage, and diffusing its delicious clove-like fragrance so profusely that the air is loaded with it for furlongs round.

Other species of Cactus and Cereus, some with yellow, and some with pink, and some with rich crimson blossoms, —the pride of our conservatories,—sprawl profusely in these gardens; and here the Bar-tail flaunts all day long sipping the nectar, and picking up myriads of minute

insects which the blossoms attract, and which lodge in the honeyed recesses.

But it is time that the reader should know what sort of a bird this Bar-tailed Comet is. Attend, then, while I describe his ball-dress, more lustrous than any fair lady ever wore at Almack's. The head, neck, upper part of the back, and a considerable portion of the under surface, are light green, with reflections of burnished gold on the cheeks and forehead. The lower back is of a deep crimson. The throat flames like an emerald. The tail is the chief feature, the feathers being broad, and greatly lengthened, in regular graduation from the central ones to the outmost pair, which are double the length of the entire bird besides. The form of the tail is widely forked, its outline having a double curve, somewhat lyre-shaped. The tail-coverts are ruddy brown; and the feathers themselves are of the richest and most glowing fire-colour, incomparably lustrous; each feather being broadly tipped with velvety black. The graduation of the feathers throws these terminal black tips to a considerable distance from each other, and their alternation with the intermediate spaces of the fiery glow has an inconceivably charming effect, as the bird makes its rapid evolutions through the air, and whisks about among the flowers, with a velocity which the eye of the beholder can scarcely follow. It is very fond of certain long trumpet-shaped pendent blossoms, into which it penetrates so far, that nothing of it can be seen except the tips of its radiant forked tail projecting from the tube.

Another family of birds that is conspicuous for gorgeous beauty is that of the Pheasants. Our own familiar species, which is said to have been brought long ages ago from the banks of the Phasis in Colchis, by Jason in the Argo,—

"Argivâ primum sum transportata carinâ," *—

is a very splendid bird, and is well painted in a few lines by Pope;—who speaks of his

"Glossy varying dyes,
His purple crest and scarlet-circled eyes;
The vivid green his shining plumes unfold,
His painted wings, and breast that flames with gold." †

But besides this, there are Indian and Chinese species which excel it in glory. There are the richly-pencilled Gold and Silver Pheasants, and the noble Reeves' and Amherst Pheasants, with their extraordinary long-barred tail plumes. The last named is a bird of unusual magnificence.

Then there is the splendid Fire-back of Sumatra and Java, which is adorned with a crest of slender stalked feathers, each expanding into a disk with spreading barbs. The head, neck, breast, and belly of this rare bird are of deep steel-blue, very lustrous, the lower part of the back fiery orange-red or flame-colour, varying in intensity according to the incidence of the light, and passing like a zone of fire round the body, though less brilliant on the abdomen; the rump and tail-coverts broad and truncate, bluish-green, each feather tipped by a paler bar. The

* *Martial*, xiii. 72. † *Windsor Forest.*

tail is erect and arched, somewhat like that of the common cock, its middle feathers are pure white, and all the rest black, with green reflections. The legs and feet, which are scarlet, and the skin of the face, purple, complete the toilet of this magnificent oriental.

What shall we say to the Argus Pheasant, the bird of Malacca with the magnificent pinions? How fine a sight must it be to see this noble fowl displaying his coxcombery in the presence of his admiring hens, strutting to and fro with his long tail feathers spread and erected, and his broad wings expanded and scraping the ground far on each side! The colours, it is true, are sober browns, varied with black and white; but how exquisitely are these arranged! Perhaps no brilliancy of tint would more charm the eye than the row of ocellated spots,—each a dark circular disk surrounded by concentric circles,—that runs along the centre of each of the enormously-developed secondary wing-quills.

To come back to colour and metallic refulgence. We must not overlook the Monâl, or Scaly Impeyan of the Himalaya chain. This fowl, which is little less than a turkey, looks as if clothed in scale armour of iridescent metal, of which the specific hues can scarcely be indicated, so changeable are they; green, steel-blue, crimson, purple, and golden-bronze,—all of the utmost intensity of colour, and of dazzling refulgence, adorn this bird, set off by a broad square patch of pure white in the middle of the back, while the crown of the head carries a drooping crest of naked-shafted, broad-tipped, green feathers. This

splendid fowl is as hardy as the turkey or pheasant, and will probably before long be domesticated in British preserves, to which it would be a noble addition, being perhaps exceeded by nothing in nature for refulgence.

In the same regions are found the Polyplectrons, or Pheasant Peacocks, birds of the same family. Look at one of these in detail, the Crested Polyplectron of the Sunda Isles. It much resembles a peacock in contour, the head and neck black, with steely reflections, relieved by a long stripe of white arching over each eye, and a broad patch of the same on the ears. The forehead and crown carry a crest of tall feathers capable of erection, and making a fine ornament. The whole under parts are velvet black; the back and rump warm brown, with paler wavy bands and lines. The coverts and secondary feathers of the wings are of the richest blue, each feather tipped with velvety black. But the tail is the grand display. It is a true tail, not a train of superincumbent feathers as in the peacock, the quill-feathers being of great length and breadth, and the whole capable of being widely expanded into an enormous rounded fan. The individual feathers are brown, pencilled and sprinkled with pale buff,—a pretty ground, on each of which is painted two large oval eye-spots of the most brilliant metallic blue or green, according to the light, contained within encircling double rings of black and white. These refulgent eyes are so set that they constitute two curved bands placed at some distance apart, running across the tail, and when this organ is expanded they impart to it a most regal appearance.

Last, but not least, in this distinguished tribe, there is the familiar Peacock, a proverb of splendour in raiment from the remote antiquity of Aristophanes and Aristotle to Mr Hollingshead, who lashes the sumptuary tendencies of our modern ladies under the title of "Peacockism."* The true Peacock, however, the genuine bird, may at least plead that no milliners' bills of £3000 are ever proved against him in Bankruptcy Courts.

I am not going to be so impertinent as to describe in detail the plumage of a bird so well known as the Peacock. Who does not know his empurpled neck so elegantly bridled, his aigrette of four-and-twenty battledore-feathers, his pencilled body-clothing, and, above all, his grand erectile train with its rows of eyelets? Who has not admired the lustre and beauty of those eyelets,—the kidney-like nucleus of deepest purple, the surrounding band of green, widening in front and filling the notch of the pupil, the broad circle of brown, and the narrow black ring edged with chestnut, and then the decomposed barbs of the feather, gilded green, all presenting the effulgence of burnished metal, or rather the glitter and glow of precious gems, flashing in the varying light? One can hardly imagine the splendour of the scene described by Colonel Williamson, as seen by him in the Jungleterry District in India, when, being engaged shooting these beautiful fowl, he estimates that not fewer than twelve or fifteen hundred Peafowl of various sizes were within sight of him for nearly an hour. "Whole woods were covered with their

* See *Good Words* for April 1861.

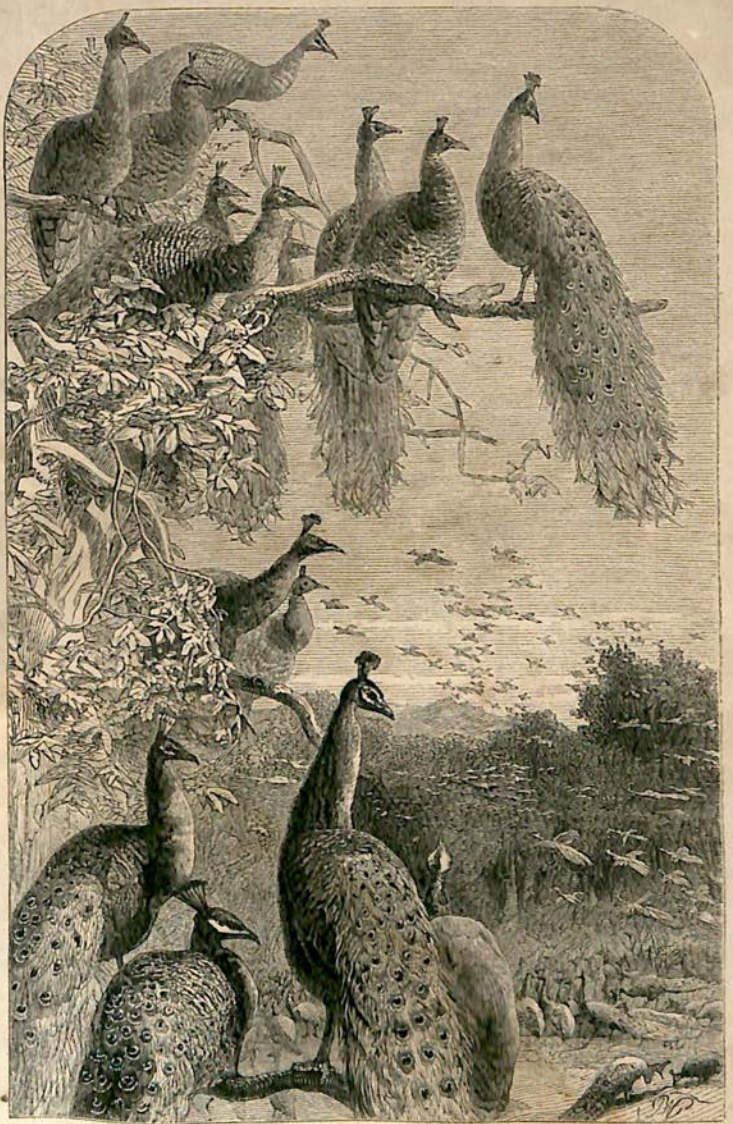
beautiful plumage, to which the rising sun imparted additional brilliancy. Small patches of plain among the long grass, most of them cultivated, and with mustard then in bloom, which induced the birds to feed, increased the beauty of the scene."

In the preceding volume I have spoken of the gorgeous beauty of the Birds of Paradise, and have quoted the description given by Lesson of his rapt feelings when, on first seeing a specimen in the forests of Papua, he could not shoot from emotion. A chapter on animal beauty cannot pass over this magnificent family, though to my own taste there is something in the refulgent radiance of the Humming-birds and Pheasants which is superior to anything seen in the Paradise-birds. The latter, or some of them at least, give me the idea of being overdressed, particularly that one called the Superb, whose singular forked gorget and shoulder-cape, gorgeous as these adornments are, with their lustrous violet and green flushes, are somewhat inelegant in form. Yet some of them are softly beautiful;—

"So richly deck'd in variegated down,
Green, sable, shining yellow, shading brown,
Tints softly with each other blended,
Hues doubtfully begun and ended;
Or intershooting, and to sight
Lost and recover'd, as the rays of light
Glance in the conscious plumes touch'd here and there.

* * * *

"This the Sun's Bird, whom Glendoveers might own,
As no unworthy partner in their flight



PEACOCK-SHOOTING.

> Through seas of ether, where the ruffling sway
> Of nether air's rude billows is unknown:
> Whom sylphs, if e'er for casual pastime they
> Through India's spicy regions wing their way,
> Might bow to as their lord." *

The Emerald Paradise, the best known of the family, seems to have been in the poet's eye; and certainly the combination of form and colour in this species is very charming. The rich chocolate of the upper parts, and the delicate lemon-yellow of the neck, contrast well with the gemmeous green lustre of the front, when the velvety plumage flashes and gleams in the sunlight. And the numerous soft floating plumes that arch out from the flanks to a great distance on all sides are exquisite in loveliness. "Even in the absolute quiet of a stuffed skin under a glass case," as Mr Wood remarks, "these plumes are full of astonishing beauty, their translucent golden-white vanelets producing a most superb effect as they cross and recross each other, forming every imaginable shade of white, gold and orange, and then deepening towards their extremities into a soft purplish red."

Mr G. Bennett, who saw a living specimen in an aviary at Macao, describes these long, elegant, loose-barbed plumes as occupying a good deal of the bird's own attention and care. "One of the best opportunities of seeing this splendid bird in all its beauty of action as well as display of plumage, is early in the morning, when he makes his toilet: the beautiful sub-alar plumage is then

* *Wordsworth.*

thrown out and cleaned from any spot that may sully its purity, by being passed gently through the bill; the short chocolate wings are extended to the utmost, and he keeps them in a steady flapping motion as if in imitation of their use in flight, at the same time raising up the delicate long feathers over the back, which are spread in a chaste and elegant manner, floating like films in the ambient air. In this position the bird would remain for a short time, seemingly proud of its heavenly beauty, and in raptures of delight with its most enchanting self; it would then assume various attitudes, so as to regard its plumage in every direction." *.

Passing over all other classes of animate existence, I shall say a few words on the surpassing loveliness which is displayed by many of the Insect tribes. The nursery prejudice, that these creatures are worthy only to be trodden under foot, as things repulsive and disgusting, is certainly decaying, though it retains its hold still in some minds. A glance through an entomological cabinet would prove how unjust are such notions. If brilliant hues, polished surface, sculptured chasings, graceful forms, and lively motions can command admiration, these are displayed by Insects to a degree which we should in vain look for in any other class of creatures. We need not speak of simple colours; these occur in profusion, of all hues, of all shades of intensity, and of the very highest degrees of brightness; combined too, in the most elegant manner, and very frequently, particularly in the *Lepidoptera*,

* *Wanderings in N. S. Wales, &c.*, ii. 43.

presenting that peculiar charm which results from the association of tints that are complemental to each other.

Words are always felt to be too poor to describe the refulgence of the hues of many of the feathered tribes;—the metallic gloss of the Trogons and the oriental *Gallinaceæ*, the gem-like flashings of the Humming-birds and the Birds of Paradise. Perhaps it would be deemed extravagant to assert, that these glories can be *excelled* by the tiny races I am now discussing; but equalled, *most fully equalled*, they assuredly are. To possess the glow of burnished metal upon the most varied hues, is, in the order *Coleoptera*, a common thing. Most of the *Eumolpidæ* are remarkable for this; of which I may instance *Chrysochus fulgidus*, a beetle from Bombay. The *Buprestidæ* have long been celebrated, for the same reason; and portions of their bodies have been used in the toilet of ladies, in association with diamonds and rubies.

Many of the *Chlamydæ* blaze with golden-crimson, purple, and the most fiery orange. The species of the small genus *Eurhinus* seem to send forth the coloured flames of the pyrotechnic art. The *Longicornes* display the same beauties, associated with gigantic size. *Cheloderus Childreni*, for example, a large beetle from Columbia, is equal to any *Buprestis* for the radiance of the green, crimson, purple, blue, scarlet, and gold, that are all at the same time flaming from its singularly-sculptured surface.

But there are impressions conveyed by the reflection of light from the bodies of many beetles, which far exceed the metallic fulgor of which I have been speaking,

beautiful as it is. I cannot hope to describe them intelligibly; I know of no combination of words which will give an idea of them. I mean the soft, almost velvety radiance of some of the *Goliathi;* of many of the *Cetoniæ,* as the genus *Eudicella,* for instance; and of not a few of the *Phanæi;* in the former two, the hue is generally green; in the latter, this colour is associated with other hues, most glowing, yet of an indescribable softness. I cannot imagine anything of this sort more charming than the soft golden and orange hue upon the green of the magnificent *Phanæus imperialis.*

Others again, as *Hoplia farinosa,* a little chafer from Southern Europe, and many of the weevil tribe (*Curculionidæ*), are covered with scales of vivid splendour, but so minute, and so closely set, that the whole surface reflects one soft but rich lustre of tints, differing according to the species. We would instance, of these, the noble species of the genus *Cyphus.* Others of the same great family, on a dark but still richly-coloured ground, have the minute scales clustered in spots or bands, forming regular patterns in much variety; and in these they reflect rainbow hues, as if a sunbeam decomposed through a prism had been solidified and pulverised; or if viewed through a lens, looking like powdered gems, each individual scale changing its hues with the slightest motion of the eye. Among these we may mention *Hypsonotus elegans, Cyphus spectabilis, Entimus splendidus,* and *E. imperialis,* commonly known as diamond beetles; and the elegantly-shaped genus *Pachyrhynchus,* of which the *P.*

gemmatus, from the Philippine Islands, is, perhaps, the most lovely of all earthly creatures.

And if we look at the *Lepidoptera*, the order more especially under review, we feel that beauty belongs to them rather as an essence than as an accident. Their broad fan-like wings have an airy lightness and grace to which the painter and the poet pay homage, when they endow the sylphs and loves of their fancy with butterfly pinions.

They are clothed with minute scales, which are the vehicle of their colours, somewhat resembling in this respect the beetles last spoken of; but they have beauties peculiar to themselves. Fine combinations and contrasts of colours are too much the rule in this order to need specification; and these are often shaded and blended with a downy softness, as in the Sphinges and Moths. As illustrious examples, I will mention the *Gynautocera*, a group of Oriental Moths approaching in some points the Butterflies, as exhibiting the most brilliant hues in bands and clouds, but softly blended and mingled, with exceeding chasteness and beauty.

Many species of the genus *Catagramma*, a group of Butterflies marked on the inferior surface of the fore-wings with scarlet and black, and on that of the hind with singular concentric circles of black on a white ground, have on the superior surface the metallic lustre common in the beetles, the wings being of golden green or blue. The genus *Urania* has this radiance still more conspicuous; while the inferior surface of some of the *Theclæ*, as *T. imperialis*, *T. Actæon*, *T. Endymion*, &c., is covered

with the most rich and varied metallic hues, as if powdered with gold, copper, and silver filings. Some Butterflies, as several of our native *Fritillaries*, and more vividly an American species, (*Argynnis passiflorœ*,) one from New Zealand, (*Argyrophenga antipodum*,) and the beautiful *Paphia Clytemnestra*, have spots of burnished silver on their inferior surface; and several of our own moths, as the genus *Plusia*, are so spotted on the upper surface. Others display a lustre between that of silver and that of pearl, as several species of *Charaxes* on one, and the magnificent *Morpho Laertes* on both surfaces. But of this sort of beauty, perhaps nothing can excel the gemmeous green, changing to azure, of *Papilio Ulysses*, or that of *Apatura* (?) *laurentia*; or, above all, of some of the great Brazilian *Morphos*. The blaze of silvery azure that flashes from *M. Adonis*, *M. Cytheris*, and *M. Menelaus*, is indescribable; the eyes are pained as they gaze upon it; yet there is said to be an unnamed species from the emerald mountains of Bogota, of which a single specimen is in a private cabinet in London, which is far more lustrous than these.

The change from one hue to another produced by the play of light in altering the angle of its reflection, has always been much admired; and this occurs in great perfection, and with much diversity, in the lovely insects of the *Lepidopterous* order.

Some of the genus *Hœtera*, (as *H. piera*, and *H. esmeralda*,) and many of the *Heliconiadœ*, as *Hymenitis diaphana*, &c., have the wings nearly or quite destitute of the

ordinary scaly clothing, presenting only a transparent membrane of great delicacy; over which the light plays with a beautiful iridescence. *Papilio Arcturus* and some allied species, are of a golden-green, changing to blue, or to glowing purple. Very many of the *Nymphalidæ* are distinguished for a flush of surpassing richness, that in one particular light gleams over the surface. Our own *Apatura Iris*, commonly known as the purple emperor, is a native example of this beauty, and still more *A. namoura;* but especially the species of the genus *Thaumantis*, as well as *Morpho Martia*, and *M. Automedon*. *Diadema bolina* also displays a purple flush over and around the white spots, which is exquisitely beautiful. In general this glow is found only in the male, but in the lovely *Epiphile chrysitis* it is common to the female.

In *Colias Electra* a warm purple glow plays over the surface in a strong light, which is the more singularly beautiful, because the permanent colour which is thus suffused is a rich golden orange. There is, however, a species (*C. Lesbia*) of which only a single specimen is known, and that is in fragments, in the Banksian Collection, which is in this respect vastly superior to the former. In all these cases, the playing gleam is more or less empurpled; in *Paphia Portia*, however, it may be called crimson.

But still more exquisitely beautiful than any of these is the fine opalescence that irradiates some butterflies in the changing beam. There is a white butterfly from Senegal (*Anthocharis Ione*) allied to our common garden whites, marked at the tips of the wings with a spot of violet, sur-

rounded by black. In a certain aspect, there plays over this spot a violet opalescence of exceeding richness. And to mention no more, (for, indeed, we know not that we could mention anything to surpass this,) the carnation spots on the black wings of *Papilio Anchises*, *P. Æneas*, *P. Tullus*, &c., are at intervals flushed with a violet opalescence, so brilliant, that we know no other object to compare with it.

In contemplating such objects, we cannot help concurring in the sentiments expressed by the pious Ray:— "Quæri fortasse à nonnullis potest, quis Papilionum usus sit? Respondeo, Ad ornatum universi, et ut hominibus spectaculo sint: ad rura illustranda velut tot bracteæ inservientes. Quis enim eximiam earum pulchritudinem et varietatem contemplans mira voluptate non afficiatur? Quis tot colorum et schematum elegantias naturæ ipsius ingenio excogitatas et artifici penicillo depictas curiosis oculis intuens, divinæ artis vestigia eis impressa non agnoscat et miretur?" And I may add, since such exquisite traces of loveliness remain in a world which Satan has spoiled and sin defiled, what must have been its glory when He who made it could take complacency in beholding it, and in the minutest details could pronounce it "very good!"

The Rev. James Smith of Monquhitter thus alludes to the exquisite beauty of some South American butterflies. One or two of the species I have already alluded to, but even these can yield additional themes of admiration. "I hold," he says, "that there are hues and shades of colour

which are positively beautiful in themselves, and independently of all associations whatever; and to look upon which merely as patches of colour, affords a gratification of no mean description. And for the truth of such an opinion, I know not where I should obtain a stronger and a more pleasing proof, than from the *Lepidoptera* to which I have alluded. The patch, for instance, which is on the posterior wings of the *Hœtera Esmeralda*, and which may be characterised as a compound of carmine and of the deepest blue dotted with two spots of vermilion, will in itself, and irrespectively of association, communicate a pleasure to every eye which looks upon it. The band of silver blue on the wing of a large *Morpho;* the deep tone, to speak in pictorial phrase, of the black in the *Papilio Sesostris*, finer even than the finest velvet of Genoa; the rich dark orange on *Epicilia Ancœa;* the blue, shining in one unnamed species like polished steel, in another (*Thecla*) with a radiant clearness, which ultramarine itself could not surpass; the satin-like golden green, the pearly lustrous white, and the deep shining emerald ribbons in *Urania Boisduvalii;* the crimson lines and spots deeper and clearer than blood, in a species to which no name is attached, of *Papilio;* the small spangles of silver with which the under surface of one of the least among them (*Cupido*) is, as it were, incrusted; the iridescent and delicate violet with which, on the same surface, a particular species of *Hœtera* is, so to speak, washed over, in a way which calls to our remembrance the 'scumbling' given by Rembrandt as the finishing

touch to his finest productions; all these, and many more, possess a beauty which I contend, in opposition to the doctrine of Alison and Jeffrey, is absolute in itself; which is altogether irrespective of association; and which the most skilful of human pencils would find it impossible completely and properly to copy." *

I must apologise to fair readers for alluding to Spiders—"nasty spiders!"—in a chapter on beauty; but prejudice must not make us shut our eyes to glories even among these. In the tropical species there is often metallic splendour and brilliance of colour. In my "Naturalist's Sojourn in Jamaica," my friend Mr Hill has written some very interesting observations on the web of a certain Spider, and on the relations of its structure with that of the Spider itself; but I allude to it now because of the elegance of the creature, the *Epeira argentata* of Fabricius. The upper surface of the body is of a glistening satiny or silvery whiteness, the belly yellow, spotted with black, and the legs marked with alternate rings of the same contrasted hues.

In the same island I was familiar with another species, (*Nephilá clavipes,*) remarkable for the length and strength of its silken cords. The body, which is lengthened, is studded with round white spots, each encircled with a black border, on a rich greenish brown ground, reminding one of the characteristic markings of the Tragopans among birds. The cephalothorax is shining black, its lustre half concealed by a clothing of short silvery down:

* *Zool.*, 3060.

the legs are very long, and have a remarkably elegant appearance from having a bunch of black hair set around the extremity of the first and second joints, like the bristles of a bottle-brush.

I fortify my own verdict with the observations of a brother naturalist on the Spiders of Borneo, presuming that those which he alludes to appear to belong to the genus *Gastracantha*, of which I have seen species in Jamaica.

"The spiders, so disgusting in appearance in many other countries, are here of quite a different nature, and are the most beautiful of the insect tribe; they have a skin of a shell-like texture, furnished with curious processes, in some long, in others short, in some few, in others numerous; but are found, of this description, only in thick woods and shaded places: their colours are of every hue, brilliant and metallic as the feathers of the humming-bird, but are, unlike the bright colours of the beetle, totally dependent on the life of the insect which they beautify, so that it is impossible to preserve them." *

It is possible that this beauty might be less evanescent if the animals were preserved in spirit or other antiseptic fluid. A writer in the *Zoologist* (p. 5929) mentions the fact that the iridescence of certain beetles (*Cassida*) which is peculiarly splendid and metallic, and which disappears immediately on the insects' becoming dry, is perpetuated in its original loveliness when the specimens are preserved in spirit, even after the lapse of several years.

* Low's *Sarawak*, 87.

The tropical species of this genus are far finer and richer than our little English kinds, though these are pretty. I was much delighted by the brilliance of some of the Jamaican species, and Sir Emerson Tennent thus speaks of them in Ceylon:—

"There is one family of insects, the members of which cannot fail to strike the traveller by their singular beauty, the *Cassididæ*, or tortoise beetles, in which the outer shell overlaps the body, and the limbs are susceptible of being drawn entirely within it. The rim is frequently of a different tint from the centre, and one species which I have seen is quite startling from the brilliancy of its colouring, which gives it the appearance of a ruby inclosed in a frame of pearl; but this wonderful effect disappears immediately on the death of the insect." *

If we turn to the vegetable world, what a profusion of beauty do we find! Exquisite are the tiny Mosses, when the fogs and rains of winter, so inimical to other vegetation, have quickened them into verdure and fruit. How they spread along the hedgerow banks in soft fleeces of vivid emerald, and shoot up their slender stalks, each crowned with its tiny urn, and wearing its fairy night-cap! Beautiful are the tiny dark-green feather-like leaves of the Forkmoss crowded on the clayey bank; beautiful the wild sprays of the plumy Hypnum; and beautiful the little round velvet cushions of Tortula, that grow on every old wall-top.

* Tennent's *Ceylon*, i. 250.

"The tiny moss, whose silken verdure clothes
The time-worn rock, and whose bright capsules rise,
Like fairy urns, on stalks of golden sheen,
Demand our admiration and our praise,
As much as cedar kissing the blue sky
Or Krubul's giant-flower. God made them all,
And what *He* deigns to make should ne'er be deem'd
Unworthy of our study."

Exquisite too are the Ferns, in their arching fronds, so richly cut in elegant tracery. See a fine crown of the Lady Fern in a shaded Devonshire lane, and confess that grace and beauty are triumphant there. And in the saturated atmosphere of the tropical islands, where these lovely plants form a very large proportion of the entire vegetation, and some of them rise on slender stems thirty or forty feet in altitude, from the summit of which the wide-spreading fronds arch gracefully on every side, like a vast umbrella of twinkling verdure, through whose filagree work the sunbeams are sparkling,—what can be more charming than Ferns?

The queenly Palms, too, are models of stately beauty. Linnæus called them *vegetabilium principes;* and, when we see them in some noble conservatory of adequate dimensions, such as the glass palm-house at Kew, crowded side by side, with their crowned heads, and lofty stature, and proud, erect bearing, we are involuntarily reminded of the monarchs of many kingdoms met in august conclave.

"Lo! higher still the stately palm-trees rise,
Chequering the clouds with their unbending stems,

And o'er the clouds, amid the dark-blue skies,
Lifting their rich unfading diadems.
How calm and placidly they rest
Upon the heaven's indulgent breast,
As if their branches never breeze had known!
Light bathes them aye in glancing showers,
And Silence, 'mid their lofty bowers,
Sits on her moveless throne."

Are the Grasses worthy of mention for their beauty? Surely, yes. Many of them display a downy lightness exquisitely lovely, as the common Feather-grass. The golden panicles of the great Quake-grass, so curiously compacted and hanging in stalks of so hair-like a tenuity as to nod and tremble with the slightest motion, how beautiful are these! And the satiny plumes of the Pampas-grass projecting from the clump of leaves form a fine object. But the Bamboos, those great arborescent Grasses of the tropics, form a characteristic feature of the vegetation of those regions, of almost unexampled magnificence. I have seen them in their glory, and can sympathise with the philosophical Humboldt in the powerful effect which the grandeur of the Bamboo produces on the poetic mind. It is an object never to be forgotten, especially when growing in those isolated clumps, that look like tufts of ostrich-plumes magnified to colossal dimensions. A thousand of these noble reeds standing in close array, each four or five inches in the diameter of its stem, and rising in erect dignity to the height of forty feet, and all waving their tufted summits in diverging curves moved by every breeze,—form, indeed, a magnificent spectacle. Growing in the most rocky situations, the Bamboo is

frequently planted in Jamaica on the very apex of those conical hills which form so remarkable a feature in the landscape of the interior, and to which its noble tufts constitute a most becoming crown.

Mr Ellis thus describes the elegance of these magnificent Grasses in Madagascar :—

"The base of the hills and the valleys were covered with the Bamboo, which was far more abundant than during any former part of the journey. There were at least four distinct varieties: one a large growing kind, erect nearly to the point; a second smaller, seldom rising much above twenty feet in height, bushy at the base, and gracefully bending down its tapering point. A third kind rose in single cane, almost without a leaf, to the height of thirty feet or more; or, bending over, formed a perfectly circular arch. I also saw a Bamboo growing as a creeper, with small short joints, feathered with slender leafy branches at every joint, and stretching in festoons from tree to tree along the side of the road, or hanging suspended in single lines from a projecting branch, and swinging gently with the passing breeze. The appearance of the Bamboo when growing is exceedingly graceful. Sometimes the canes, as thick as a man's arm at the base, rise forty or fifty feet high, fringed at the joints, which are two or three feet apart, with short branches of long, lance-shaped leaves. The smaller kinds, which abound most in this region, are still more elegant; and the waving of the canes, with their attenuated but feathery-looking points, bending down like a plume, and the tremulous quivering,

even in the slightest breeze, of their long, slender leaves, present ever-varying aspects of beauty; and, combined with the bright-green colour of the Bamboo-cane and leaf, impart an indescribable charm to the entire landscape." *

Glorious in loveliness are the *Musaceæ*, the Plantains and Bananas of the hot regions. Humboldt calls the Banana "one of the noblest and most lovely of vegetable productions;" and truly its enormous, flag-like leaves of the richest green, permeated by nervures running transversely in exactly parallel lines, and arching out in every direction from the succulent, spongy, sheathed stem, command our admiration, apart from the beauty of their flowers, or the importance of their fruit.

In a description of a mountain scene in Tahiti, drawn with graphic power by Charles Darwin, the Banana forms a prominent element:—"I could not look on the surrounding plants without admiration. On every side were forests of Banana; the fruit of which, though serving for food in various ways, lay in heaps decaying on the ground. . . . . As the evening drew to a close, I strolled beneath the gloomy shade of the Bananas up the course of the stream. My walk was soon brought to a close, by coming to a waterfall between two and three hundred feet high; and again above this there was another. . . . In the little recess where the water fell, it did not appear that a breath of wind had ever blown. The thin edges of the great leaves of the Banana, damp with spray, were unbroken, instead of being, as is so generally the case, split into a

* Ellis's *Visit to Madagascar*, 313.

thousand shreds. From our position, almost suspended on the mountain-side, there were glimpses into the depths of the neighbouring valleys: and the lofty points of the central mountains, towering up within sixty degrees of the zenith, hid half the evening sky. Thus seated, it was a sublime spectacle to watch the shades of night gradually obscuring the last and highest pinnacles." *

This scene must have been one of surpassing sublimity and loveliness. Few doubtless have ever beheld anything that can be compared with it. But perhaps many have felt—I have, often,—that there are occasions in which the sense of the beautiful in nature becomes almost painfully overpowering. I have gazed on some very lovely prospects, bathed perhaps in the last rays of the evening sun, till my soul seemed to struggle with a very peculiar undefinable sensation, as if longing for a power to enjoy, which I was conscious I did not possess, and which found relief only in tears. I have felt conscious that there were elements of enjoyment and admiration there, which went far beyond my capacity of enjoying and admiring; and I have delighted to believe, that, by and by, when, in the millennial kingdom of Jesus, and, still more, in the remoter future, in the dispensation of the fulness of times, the earth—the "*new* earth,"—shall be endowed with a more than paradisaical glory, there will be given to redeemed man a greatly increased power and capacity for drinking in, and enjoying the augmented loveliness. Doubtless the risen and glorified saints, sitting with the

* *Nat. Voyage*, ch. xviii.

King of kings upon His throne, will have the senses of their spiritual bodies expanded in capacity beyond what we can now form the slightest conception of; and as all then will be enjoyment of the most exquisite kind, and absolutely unalloyed by interruption or satiety,—the eye will at length be satisfied with seeing, and the ear be satisfied with hearing. "*I shall be satisfied,* when I awake up with thy likeness."

It is in *Flowers* that the beauty of the vegetable world chiefly resides; and I shall now therefore select a few examples from the profusion of lovely objects which the domain proper of Flora presents to us.

That very curious tribe of plants, the *Orchideæ,* so remarkable for the mimic forms of other things, that its blossoms delight to assume, is also pre-eminent in gorgeous beauty. Take the *Sobraliæ,*—terrestrial species from Central America, where they form extensive thickets, growing thrice the height of man, with slender nodding stems, and alternate willow-like leaves, and terminal racemes loaded with snow-white, pink, crimson, or violet flowers.* Imagine the crushing through "thickets" of the lovely *S. macrantha!* The large lily-like blossoms of this species are eight inches long, and as many wide, of the richest purple crimson, and of the most elegant shape conceivable, with the lip so wrapped round the column as to appear funnel-shaped, bordered by an exquisitely-cut fringe.

I have before alluded to *Phajus Tankervilliæ,* that rich

* Pöppig.—*Nov. Gen. et Sp.,* i. 54.

lily-like spike of blossom which I stumbled on in the midst of a dense thicket in the mountains of Jamaica. Another terrestrial genus of great elegance is *Cypripedium*, of which we have one native species, *C. calceolus*, the yellow lady's slipper,—one of the most charming, but the rarest and most difficult of propagation, of British plants. But this is far excelled in beauty by many of the exotic species; as, for example, the exquisite *C. barbatum* from Malacca. The very foliage is princely; for the nervures and cross-veins form a network pattern of dark green upon the light green area of each broad leaf. The blossom rears up its noble head erect, with its standard-petal of white, striped with green and purple, the wing-petals studded with purple tubercles along their edges, and the lip or slipper-shaped petal of a dark purple hue.

My readers may have occasionally noticed a little plant, in the most recherchées stove-houses, of so much delicacy and preciousness that it is invariably kept under a bell-glass. I mean the *Anœctochilus setaceus*. It belongs to this tribe, and is a terrestrial species, growing about the roots of the trees in the humid forests of Ceylon. Its exquisite loveliness has attracted the attention of even the apathetic Cingalese, who call it by the poetical epithet of *Wanna Raja*, or king of the forest. It does not appear to possess any peculiar attractiveness in its blossoms,—indeed, I have never seen it in flower; but its leaves, which grow in opposite pairs, are elegantly heart-shaped, of a deep rich greenish-brown hue, approaching to black, of a surface which resembles velvet, reticulated all over

with pale golden veins, which, being numerous and minute, have a very charming appearance, somewhat like the pale network on black patches which we see in the wings of some dragon-flies.

The epiphyte Orchids are also magnificent in beauty. One of the handsomest genera is *Dendrobium*, containing many species, mostly natives of Southern Asia and the great islands. Perhaps the finest of all is *D. nobile*, of which the sepals and petals are greenish-white, tipped with rich purple, and the downy tube-like lip is of the same regal hue in the interior, with a pale yellow margin.

By the side of this you may set the lovely *Huntleya violacea*, one of the discoveries of Sir R. Schomburgk in the interior of Guiana. Its broad wavy petals of the softest richest violet, "vary in intensity from deepest sapphire to the mild iridescence of opal." This fine flower has a melancholy interest from its being associated with the death of Sir Robert's friend and fellow-servant, Mr Reiss. The gorgeous scenes of tropical vegetation in which the plant was found, and the sad accident, are thus depicted by the accomplished traveller:—

"I discovered the *Huntleya violacea* for the first time in October 1837, then on my ascent of the river Essequibo. The large cataract, Cumaka Toto, or Silk Cotton Fall, obliged us to unload our corials, and to transport the luggage overland, in order to avoid the dangers which a mass of water, at once so powerful and rapid, and bounded by numerous rocks, might offer to our ascent.

While the Indians were thus occupied, I rambled about one of the small islands, which the diverging arms of the river formed in their descent, and the vegetation of which had that peculiar lively appearance which is so characteristic of the vicinity of cataracts, where a humid cloud, the effects of the spray, always hovers around them. Blocks of syenite were heaped together; and while their black shining surface contrasted strongly with the whitish foam of the torrent, and with the curly waves beating against the rocky barriers—as if angry at the boundary which they attempted to set to the incensed element—their dome-shaped summits were adorned with a vegetation at once rich and interesting. *Heliconias, Tillandsias, Bromelias, Ferns, Pothos, Cyrtopodiums, Epidendrums, Peperomias,* all appeared to struggle for the place which so small a surface afforded to them. The lofty mountains, Akaywanna, Comute, or Taquia, and Tuasinki, recede and form an amphitheatre, affording a highly interesting scene, and no doubt the most picturesque of that part of the river Essequibo.

"I was attracted by a number of *Oncidium altissimum* which covered one of the rocky piles, and astonished me by their long stems and bright colour of their flowers, when my attention was more powerfully attracted by a plant, the appearance of which, although different from the pseudo-bulbous tribe, proclaimed, nevertheless, that it belonged to that interesting family, the *Orchideæ.* The specimens were numerous; and clothed almost, with their vivid green, the rugged and dark trunks of the gigantic

trees, which contributed to the majestic scene around me. It was not long before I discovered one of these plants in flower. It was as singular as it was new to me;—the sepals and petals of a rich purple and velvet-like appearance; the helmet, to which form the column bore the nearest resemblance, of the same colour; the labellum striated with yellow.

"In the sequel of my expeditions, I found it generally in the vicinity of cataracts, where a humid vapour is constantly suspended, and where the rays of the sun are scarcely admitted through a thick canopy of foliage. I traced the *Huntleya* from the sixth parallel of latitude to the shady mountains of the Acaria chain near the equator; but in its fullest splendour it appeared at one of the small islands among the Christmas cataracts in the river Berbice. There is a melancholy circumstance connected with the plant, which its appearance never fails to recall to my memory. Their singular beauty at this spot induced my friend, Mr Reiss, who accompanied me as a volunteer during the unfortunate expedition up the river Berbice, to draw and paint it on the spot. He was yet occupied with this task when the last of our canoes was to descend the dangerous cataract. He arose from his occupation, desirous to descend with the Indians in the canoe, although against my wish, but he persisted. The canoe approached the fall; it upset; and, of thirteen persons who were in it at the time, he was the only one who paid the rash attempt with his life. He is now buried opposite that island, the richest vegetable pro-

ductions of which it was his last occupation to imitate on paper and in colours." *

We might linger long on these flowers of strange loveliness, but space compels us to forsake them and to turn to some other examples in the wide range of Flora's domains. How glorious a sight must be the sheeted Rhododendrons of the Himalaya peaks, on whose lofty elevations Dr Hooker found these fine plants in great prominence, "clothing the mountain-slopes with a deep-green mantle, glowing with bells of brilliant colours; of the eight or ten species growing here, [on the Zemir, in Sikkim, twelve thousand feet above the sea,] every bush was loaded with as great a profusion of blossoms as are their northern congeners in our English gardens!" †

The noblest of the genus is that which is dedicated to Lady Dalhousie. It is an epiphyte, being always found growing, like the Orchids, among mosses and ferns, upon the trunks of large trees, especially oaks and magnolias, at an elevation of from seven to ten thousand feet. In this particular, in the fragrance of its noble white blossoms, in its slender habit, in the whorled arrangement of its branches, and in the length of time during which it continues in flower in its native regions, viz., from April to July, it differs from all its fellows of the same genus that inhabit northern India.

The flowers are four inches in length and four in diameter, with a broad trumpet lip. Their colour is pure

* Lindley's *Sertum Orchid.*; pl. xxvi.
† *Himal. Journ.*, ii. 58.

white, assuming a delicate rosy tinge as they become old, and sometimes becoming spotted with orange. They have an odour which resembles that of the lemon.

Of this and the following species Dr Hooker writes from Dorjiling, seven thousand feet above the sea:—"On the branches of the immense purple-flowered magnolia, (*M. Campbellii,*) and those of oaks and laurels, *Rhododendron Dalhousiæ* grows epiphytally, a slender shrub bearing from three to six white lemon-scented bells, four and a half inches long and so many broad, at the end of each branch. In the same woods the scarlet Rhododendron (*R. arboreum*) is very scarce, and is outvied by the great *R. argenteum,* which grows as a tree, forty feet high, with magnificent leaves twelve to fifteen inches long, deep green wrinkled above and silvery below, while the flowers are as large as those of *R. Dalhousiæ* and grow more in a cluster. I know nothing of the kind that exceeds in beauty the flowering branch of *R. argenteum,* with its wide-spreading foliage and glorious mass of flowers." *

The latter, which is nearly equal to *R. Dalhousiæ* in the size of its blossoms, and perhaps superior to it in other respects, is another white-flowered species. It is, as described above, a tree with large massive leaves of a silvery tint beneath. When young, they are exquisitely beautiful, being encased in long flesh-coloured cones of large scales, of very ornamental appearance. The flowers are three inches long, forming a compact globose head.

* *Himal. Journals,* i. 126.

They secrete a large quantity of honey, which is said to be poisonous, as is also that of *R. Dalhousiæ*.

The grandeur and beauty of the same genus are celebrated by Mr Low, as he saw the species growing in Borneo, where too their parasitic character struck him, as it had done Dr Hooker:—

"Perhaps the most gorgeous of the native plants are the various species of the genus *Rhododendron*, which here assume a peculiar form, being found epiphytal upon the trunks of trees, as the genera of the tribe *Orchidaceæ*. This habit, induced probably by the excessive moisture of the climate, is not, however, confined to the Ericaceous plants, but also prevails with the genera *Fagræa*, *Combretum*, and many others, usually terrestial; the roots of the Rhododendrons, instead of being, as with the species [which are] inhabitants of cold climates, small and fibrous, become large and fleshy, winding round the trunks of the forest trees; the most beautiful one is that which I have named in compliment to Mr Brooke. Its large heads of flowers are produced in the greatest abundance throughout the year: they much exceed in size those of any known species, frequently being formed of eighteen flowers, which are of all shades, from pale and rich yellow to a rich reddish salmon-colour; in the sun, the flowers sparkle with a brilliancy resembling that of gold dust.

"Four other species which I discovered are very gorgeous, but of different colours, one being crimson and

another red, and the third a rich tint between these two: of the fourth I have not yet seen the flowers." *

Take an example from another order. The Lightning-tree of Madagascar rises before us in the graphic pages of Mr Ellis:—

"But the most magnificent objects were the fine trees of *Astrapœa Wallichii*, or *viscosa*. The name of this Malagasy plant was derived from the word for lightning, on account of the brilliancy of its flowers; and Sir Joseph Paxton and Dr Lindley have thus spoken of *A. Wallichii*: —'One of the finest plants ever introduced. And when loaded with its magnificent flowers, we think nothing can exceed its grandeur.' I had seen a good-sized plant growing freely at Mauritius, but here it was in its native home, luxuriating on the banks of the stream, its trunk a foot in diameter, its broad-leaved branches stretching over the water, and its large, pink, globular, composite† flowers, three or four inches in diameter, suspended at the end of a fine down-covered stalk, nine inches or a foot in length. These, hanging by hundreds along the course of the stream, surpassed anything of the kind I had seen, or could possibly have imagined. I frequently met with the *Astrapœa* afterwards, but always growing near the water, and its branches frequently stretching over a lake or river." ‡

* Low's *Sarawak*, 65.

† The writer by this term doubtless alludes to the panicles or heads *compounded* of many individual flowers; for the plant does not belong to the order *Compositæ*, but to *Byttneriaceæ*.

‡ Ellis's *Madagascar*, p. 390.

The Leguminous or Papilionaceous order presents many plants of striking beauty, both in foliage, which is often of extreme lightness and elegance, and also in blossom. They are among the gayest and most graceful of plants in all regions. The magnificent vegetation of the Mauritius contains one of notable glory, the Flamboyant, thus noticed by Ellis:—

"Conspicuous beyond all the rest is the stately and gorgeous *Poinciana regia*, compact-growing and regular in form, but retaining something of the acacia habit, rising sometimes to the height of forty or fifty feet, and, between the months of December and April, presenting, amidst its delicate pea-green pinnated leaves, one vast pyramid of bunches of bright, dazzling scarlet flowers. Seen sometimes over the tops of the houses, and at others in an open space, standing forth in truly regal splendour, this is certainly one of the most magnificent of trees. Its common name is *mille fleurs*, or *flamboyant*." *

I have had the delight of seeing the *Poinciana pulcherrima* in Jamaica, where it goes by the name of Flower-fence, or sometimes, the "Pride of Barbadoes." It is, when in flower, a gorgeous mass of scarlet and orange, and it seemed to me the most magnificent thing in its way, that I had ever seen. It does not, however, attain the dimensions of its antipode, rarely exceeding those of a large shrub.

I know not what the Burmese tree is, which is alluded to in the following extracts from letters which I have

* Ellis's *Visits to Madagascar*, 57.

received from my esteemed friend, Captain G. E. Bulger, of the 10th Regiment:—

"I shall be exceedingly obliged by your telling me whether you are familiar with the tree known in the West Indies and South America as the 'Bois Immortel;' and whether you think the leaf herewith sent belongs to it.

"During the cool season in Burmah, the forest presents a gorgeous sight, from the multitude of scarlet blossoms which a large kind of tree puts forth; and I am strongly inclined to think that this splendid ornament of the jungles is, at all events, allied to the Bois Immortel of the Western World.

"The tree I speak of begins to flower about the middle of December, at which time the leaves commence to wither and drop off. By the end of January, when it is in full bloom, there is hardly a leaf remaining, but it continues one mass of scarlet blossom until March. The flower is shaped like that of the pea.

"If you can enlighten me on this point I shall be indeed very much obliged."

I was compelled to confess my ignorance even of the South American beauty, and my friend thus replied:—

"I first read of the 'Bois Immortel' in 'Waterton's Wanderings,' and I subsequently saw a coloured representation of the tree in Mr Gould's magnificent work on Humming-Birds. I think the specific name was also given in that work, but it is some time ago, and I have almost forgotten what it was like. Since I saw these two

works, I have heard officers speak of the splendour of the South American forests during the season of 'Le Bois Immortel,' and have heard more than one say that they believed nothing on earth could be more magnificent than 'matchless Trinidad' when these trees are in full bloom. The autumnal beauty of the North American woods is, doubtless, familiar to you, and I question very much whether there is anything richer or more lovely to be found even in South America."

Even the humblest orders of plants have the element of beauty bestowed on them with no niggard hand. Who would have expected, among the *Chenopodeæ*, and, above all, in the lowly little Saltworts, to find such a glowing scene as Mr Atkinson describes?—

"We were now on a heavy sandy steppe—part of the Sackha Desert, which extends into the Gobi—and vegetation was so very scant, that even the steppe grass had disappeared. The *Salsola* was growing in a broad belt around the small salt lakes, its colour varying from orange to the deepest crimson. These lakes have a most singular appearance when seen at a distance. The sparkling of the crystallised salt, which often reflected the deep crimson around, gave them the appearance of diamonds and rubies set in a gorgeous framework. I rode round several times, admiring their beauty, and regretting that it was impossible to stay and visit a large lake, which I observed, ten or fifteen versts distant, surrounded with green, orange, and crimson."*

* Atkinson's *Siberia*, 472.

The microscope, too, will bring out beauties in flowers which the unassisted eye is incompetent fully to recognise. If we take a scarlet Geranium, or a purple Heartsease, the eye is delighted with the brilliancy of the colouring; but on placing a petal of either on a slip of glass, under a pretty high magnifying power, and reflecting the full rays of the sun through the object, the rich gorgeousness of the hue, the sparkling gem-like radiance of the surface, and the exquisitely-regular form of the round cells, with their clear interstices, form a spectacle of glorious beauty that almost surpasses the conception of one who has not seen it.

I shall close this chapter, which might easily have been expanded into a volume, with a reference to an humble and minute plant, whose fairy loveliness, combined with an almost unkillable hardiness of constitution, has won for it a place in every garden, however unpretending, and however ungenial in its locality,—the London-pride. This exquisite little Saxifrage, general favourite as it is, requires the microscope to bring out its beauties to advantage, but under a good instrument you cannot fail to be charmed with it. I have one before me at this moment, and will describe what I see.

First, I notice, on a cursory glance, that the whole plant is clothed with tiny hairs; I take one of the flower-stalks and examine these with a power of three hundred diameters. Each now becomes a stem of glass-like clearness, tapering upwards to a point, where it bears a richly crimson cup, and in this is seated a globule of colourless

glass, just as an acorn sits in its shell. The multitude of these organs—glandular hairs, the botanist calls them—standing up side by side, rising to varying heights, and displaying various degrees of development, is a very pleasing sight.

I turn to an unopened bud, putting on a lower power, and viewing it as an opaque object, with reflected light by the aid of the Lieberkuhn. Here are the parting sepals of the calyx, painted with rose-pink and pea-green, and studded all over with the knobbed hairs just noticed; the coloured surface is rough with granules, but it is the roughness of glass, for every knob gleams and sparkles with light. The corolla, a little white ball, displays its petals smoothly folded over each other, and their surface has the same appearance of granular glass as that of the calyx.

But now let me examine this blossom just expanded this morning,—the very first of the season, by the way. I must have a low power for this, eighty diameters, or so. Oh, how exquisite! The little saucer of five oval petals, each of snowy whiteness, bearing its bow of lovely crimson specks, with a spot of gamboge-yellow for the chord, and the whole sparkling with glassy points as before. The pale red germen in the centre, rising into two points of snow, their rosy tips pressed close together, as if the twins were kissing. The ten stamens, five short alternating with five long ones, and each bearing its pretty kidney-shaped anther of pale scarlet. No; all are not kidney-shaped; for here is one which has burst, and the grains of red pollen are seen covering its rough purple sur-

face; and here is one stamen from the point of which the anther has gone, leaving only two or three pollen-grains adhering. Behind all, I see the sepals of the calyx, peeping out between the petals, and forming a fine dark background for them, and for the longer filaments.

And now I say to my readers, one and all,—you may not have the opportunity to examine the glorious tropical Orchids, or the gorgeous Flamboyant, but go and pluck a flower of the London-pride, and you will have before your eyes such a production of Divine handiwork as may well excite the admiration and adoration of an angel.

XL

PARASITES.

VAST as is this round world on which we live, its surface is not nearly large enough for all the living creatures which are ordained to inhabit it. Multitudes of animals do not walk on the ground, or swim in the waters, or fly in the air, but find the scene of their abode on or in the bodies of other animals. Multitudes of plants do not grow out of the soil, but attach themselves to other plants, and draw their sustenance and support thence. Nay, there are parasites upon parasites, and this, according to Hood, in an infinitely descending series.

> "Great fleas have little fleas
> Upon their backs to bite 'em;
> And little fleas have lesser fleas;
> And so *ad infinitum*."

Perhaps the poet's imagination ran a little ahead of his science here; but the idea of an *infinite* succession of parasites, like nests of pill-boxes, is surely a funny one. There is nothing funny, however, in the thought "that even man," who was made in the image of God, "bears about in his vital organs various forms of loathsome creatures, which riot on his fluids, and consume the very substance of his tissues while ensconced where no efforts of

his can dislodge them, no application destroy them. So it is; and few physical facts are better calculated to humble man, and stain the pride of his glory, than to feel that he may at any moment be nourishing a horrid tape-worm in his alimentary canal, or that his muscles may be filled with millions of microscopic *trichinæ*.

I will not dwell on these; though, if I were writing a book of pure science, there is a wondrous array of facts of the most striking and interesting character, connected with the structure, the metamorphoses, and the habits, of the Entozoic Worms, which I might present to my readers. It is more pleasant to consider other facts, perhaps not less marvellous, which, as they do not come quite so home to our personal feelings, will not excite horror and disgust in our minds.

The *economy* of creation is remarkable. He who, by His divine manipulation converted five loaves and two small fishes into a hearty meal for five thousand men, besides women and children, and who could, with the same ease have made them a hundred times as much, said, when the meal was over, "Gather up the fragments, that nothing be lost." And, when He spread the earth with life, though His resources were infinite, He ordained that one object, itself healthfully enjoying life, and fulfilling its own proper ends of being, should be a microcosm, on which another range of life should find its sphere, and on which it should disport, as on an independent world. I have often admired, in the gorgeous tropical forests, what a wilderness of vegetation a single

tree supports; what numbers of orchids and wild pines spring out of the forks, what creepers and lianes hang and twine about its branches, what elegant ferns cluster on the horizontal limbs, what snake-like cacti creep from bough to bough, what mosses, and jungermanniæ crowd in every crevice, what many-coloured lichens stud the rugged bark! And then animal life is swarming in all this great field of parasitic vegetation. Reptiles and birds, snails and slugs, insects and millepedes, and spiders and worms nestle by thousands in such prolific situations, so that a great old tropical tree, one of the giant figs or cotton-trees, is a very museum in itself.

And in my wanderings along the sea-edge here at home how often have I been amazed at the diverse population, plant and animal, which crowds a single oar-weed, or tangle! The stem fringed with delicate red-weeds, as the minute *Rhodymeniæ*, and *Polysyphoniæ*, and *Callithamnia;* the tortuous roots studded with Anemones, with *Flustræ* and *Lepraliæ*, and multitudes of other *Polyzoa*, with tiny Polypes of many kinds, with Barnacles and Limpets, and sheltering small Crustacea, and Mites, and Annelids by scores.

Mr Darwin has an interesting passage on this subject, evoked by the profusion of parasitic life on the long sea-weed of Cape Horn (*Macrocystis*). "The number of living creatures" he remarks, "whose existence intimately depends on the Kelp is wonderful. A great volume might be written, describing the inhabitants of one of these beds of sea-weed. Almost all the leaves, excepting those that

float on the surface, are so thickly incrusted with corallines as to be of a white colour. We find exquisitely delicate structures, some inhabited by simple hydra-like polypi, others by more organised kinds, and beautiful compound Ascidiæ. On the leaves also, various patelliform shells, Trochi, uncovered molluscs, and some bivalves are attached. Innumerable crustacea frequent every part of the plant. On shaking the great entangled roots, a pile of small fish, shells, cuttle-fish, crabs of all orders, sea-eggs, star-fish, beautiful Holuthuriæ, Planariæ, and crawling nereidous animals of a multitude of forms, all fall out together. Often as I recurred to a branch of the kelp, I never failed to discover animals of new and curious structure. In Chiloe, where the kelp does not thrive very well, the numerous shells, corallines, and crustacea are absent; but there yet remain a few of the Flustraceæ, and some compound Ascidiæ; the latter, however, are of different species from those in Terra del Fuego: we here see the fucus possessing a wider range, than the animals which use it as an abode. I can only compare these great aquatic forests of the southern hemisphere, with the terrestrial ones in the intertropical regions.

"Yet if in any country a forest was destroyed, I do not believe nearly so many species of animals would perish as would here, from the destruction of the kelp. Amidst the leaves of this plant numerous species of fish live, which nowhere else could find food or shelter: with their destruction the many cormorants and other fishing birds,

the otters, seals, and porpoises, would soon perish also; and lastly, the Fuegian savage, the miserable lord of this miserable land, would redouble his cannibal feast, decrease in numbers, and perhaps cease to exist."

I have alluded to the epiphytic plants which are so abundant in the tropics, and which add so greatly to the gorgeousness of the forests there. The most remarkable, or, at all events, the best known, of these are the *Orchideæ*, to which, as I have already had occasion more than once to speak of them, I shall do little more than refer here. These establish themselves in the forks, upon the greater limbs, and even in the roughnesses of the bark of the trunk, adhering by their long, interlaced roots, which look like knotted whip-cord, and forming their bunches of psuedo-bulbs, whence their succulent, thick, but elegant leaves project,—a great tuft of verdure; and their fantastic flower-scapes wave in the air or droop with their weight of gorgeous bloom. Thus they derive their nourishment from the humid atmosphere alone, being dependent on the friendly tree only for support and elevation. Humidity seems essential to the vigour of these and most other forms of parasitic vegetation. In the deep shady, gloomy forests of Java, which constitute the zone of vegetation around the base of the mountains, these plants abound, where the air is heavy and damp with the vapours that cannot ascend, and where the density of the foliage is almost frightful; where heat, moisture, and a most extraordinarily deep and rich vegetable soil combine to produce wood of a fungus-like softness, and an inconceivable abund-

ance of twining plants and epiphytes. In those forests, more especially where huge fig-trees constitute the principal part of the timber, intermingled with the most tropical forms of vegetation, such as *Sterculiaceæ*, *Sapindaceæ*, and *Artocarpeæ*, tufts of *Orchideæ* attain a vast size and luxuriance, in company with Aroideous and Zinziberaceous plants.* In Demerara, Mr Henchman found masses of *Oncidium altissimum* and *Maxillaria Parkeri* of wide dimensions, and so densely growing as to defy any attempt at intrusion; and on the Spanish main he saw the *Epidendrum* known as the "Spread Eagle" clasping enormous trees, and covering them from the top to the bottom.

The fig-trees, which are among the most gigantic of the tropical forest-trees, and which support an immense profusion of epiphytes, are themselves frequently parasitic and epiphyte in their early condition. It is not uncommon in Jamaica to see a network of roots partially embracing the trunk of some great tree, far up its column, and gradually creeping round and downward. I have seen an old wall so covered, presenting a very curious spectacle. The roots of a wide-spreading fig growing out of the summit of the wall, had spread over its perpendicular surface, down to the earth, all in the same plane, clinging to the wall; the chief roots were as thick as a man's leg, but subordinate roots had proceeded from one to another, anastomosing in all directions (if I may use such a term), so as to make a most elaborate network of

* Reinwardt.

a multitude of meshes of various angular forms and sizes. These cross-roots were *at each extremity* united with the larger roots, and looked as if the whole network had been skilfully carved out of one solid plank of wood, by cutting out the areas or meshes, and rounding the component bars; the very bark that covered the whole was continuous, where the roots united, as if they had been always integrally one,

The only mode in which I can account for this singular phenomenon is the following hypothesis:—The seed of the tree was originally deposited on the summit of the wall, beneath the eaves. As it germinated, the roots ran down towards the earth, some perpendicularly, some diagonally; but all creeping along the surface of the wall, no roots having shot out from its perpendicular. As these roots increased, they sent out side rootlets, which, still running on the face of the wall, by and by came in contact with another of the primary roots. Then, instead of creeping *over* it, as the roots of other trees would have done, the soft tip of the rootlet actually united with the substance of the root at the point of contact, the fibres of the two becoming interlaced, and their united surfaces gradually becoming covered with a common bark. The repetition of this process had produced the very curious wooden net which I have attempted to describe.

A still more remarkable example of this parasitic mode of growth I have seen in the same island. By the side of a mountain road was a large fig-tree, the base of whose

trunk was about thirty feet from the ground. Thence it reared itself up pillar-like towards the heavens, and spread abroad its vast horizontal array of branches across the road. From the same point there descended to the earth a hollow cone of roots, interwoven and anastomosed, especially at the upper parts, in the same manner as those of the boiling-house wall, but forming towards the bottom only three or four flattened irregular columns. Into the area inclosed by this network of roots a person might enter, for it was about six feet wide, and, looking up, behold the base of the trunk eight or ten yards above his head.

The explanation of this curious phenomenon depends upon the tendency just mentioned. On this site once stood a large tree of some other species, probably a cotton-tree (*Eriodendron*), or some other soft-timbered kind. The little scarlet berry of a Fig-tree was carried by some vagrant Banana-bird or Pigeon to its boughs, and there devoured. After the little truant had finished his morsel, he perhaps wiped his beak against the rough bark of the trunk, beside the branch on which he was seated. Some of the minute seeds, enveloped in mucilage, were thus left on the tree, which the rain presently washed down into the broad concavity of the forks, where, among moss and rotten leaves, it soon germinated and grew. The roots gradually crept down the trunk of the supporting tree, closely clinging to its bark, and by their interlacement at length formed a living case, enveloping it on every side, and penetrating the earth around its base.

The growth of these, and also of the inclosed tree, daily induced a tighter and tighter pressure on the latter, which at length arrived at such a degree as to stop the circulation of the sap between the bark and the wood. Death, of course, was the result, and speedy decay reduced the supporting tree to a heap of mouldering dust: while the parasite, now able to maintain its own position by its hollow cone of roots, increased in size and strength, and overtopped its fellows of the forest;—*a tree standing upon stilts.*

A few years ago I was struck with the appearance of an East Indian species of the same genus in one of the conservatories at Kew. Three shoots had run up the wall, clinging so close, that the leaves looked as if they were actually glued to the bricks, one over the other, in the most regular manner. Yet, on examination, I saw that the leaves did not adhere at all; the only support was that of the tiny rootlets which proceeded laterally from each stem, which the leaves concealed. The appearance of the whole was so curious, with the pale growing bud peeping out from beneath the topmost leaf, that I was greatly attracted by it. The base of the plant was in a pot, but the attendant informed me that this connexion was about to be cut off, by severing each shoot at the point where it first seized the wall. The leaves above this point, by their superior size and vigour, shewed that the plant was already independent of its pot, and that it was capable of supporting itself, like a proper air-plant, by imbibition from the atmosphere alone, needing nothing

more than support in its upright position, which it obtained from the wall by its clinging aerial rootlets.

Every one who has wandered in a primeval forest of the tropics, whether in the eastern or the western hemisphere, has been struck by the inconceivable profusion of the climbers and twiners with which the trees are laced together. They are found from the thickness of a warship's cable to that of pack-thread; the stronger ones often uncouthly twisted together, and binding tree to tree. They are of the orders *Malpighaceæ*, *Apocyaneæ*, *Asclepiadeæ*, *Bignoniaceæ*, &c., and often are adorned with the most brilliant flowers.

I have before cited descriptions of these wonderful lianes, as they occur in the forests of South America; my readers may like to peruse Sir Emerson Tennent's graphic sketch of those of Ceylon:—

"It is the trees of older and loftier growth that exhibit the rank luxuriance of these wonderful epiphytes in the most striking manner. They are tormented by climbing plants of such extraordinary dimensions that many of them exceed in diameter the girth of a man; and these gigantic appendages are to be seen surmounting the tallest trees in the forest, grasping their stems in firm convolutions, and then flinging their monstrous tendrils over the larger limbs till they reach the top, whence they descend to the ground in huge festoons, and, after including another and another tree in their successive toils, they once more ascend to the summit, and wind the whole into a maze of living network as massy as if formed by

the cable of a line-of-battle ship. When, by and by, the trees on which this singular fabric has become suspended give way under its weight, or sink by their own decay, the fallen trunk speedily disappears, while the convolutions of climbers continue to grow on, exhibiting one of the most marvellous and peculiar living mounds of confusion that it is possible to fancy. Frequently one of these creepers may be seen holding by one extremity the summit of a tall tree, and grasping with the other an object at some distance near the earth, between which it is strained as tight and straight as if hauled over a block. In all probability the young tendril had been originally fixed in this position by the wind, and retained in it till it had gained its maturity, where it has the appearance of having been artificially arranged as if to support a falling tree." *

Leaving the vegetable world, we may find some very curious examples of parasitism among Insects. Every one who has paid the slightest attention to this class of animals is aware that there are slender flies called *Ichneumons,* whose grubs are hatched and reared in the bodies of other insects. Many of these have the ovipositor greatly lengthened, and projecting like a very slender needle from the extremity of the abdomen. In some species, this needle-like organ is three or four times the entire length of the body; and this great longitude is intended to reach the pupæ of wasps and similar insects which inhabit deep holes. The needle itself is well worthy of

* Tennent's *Ceylon,* i. 104.

study. It is not simple, but composed of two pieces forming a sheath, which open and reveal a central finer filament, furnished at its tip (in *Pimpla manifestator*, for example) with saw-like teeth. With this instrument, which possesses great elasticity and flexibility, the insect works, as a carpenter with his brad-awl, boring through the clay, with which the wasp has closed up the hole that contains her grub, until the tip of the ovipositor reaches the soft body of the insect. Into this it pierces, and deposits an egg, and is withdrawn. The slight puncture is scarcely felt by the grub, which continues to eat and grow; the inserted egg, however, presently hatches, and produces the ichneumon-grub, which begins to feed on the fat of the wasp-grub, instinctively avoiding the vital parts, until the latter has attained nearly its full size, and is ready to pass into the pupa state; when, its vigour being gone, it fails to accomplish the metamorphosis, the insidious intruder, now also full grown, taking its place, and by and by issuing from the hole a perfect Ichneumon.

How often has the enthusiastic young entomologist been subjected to sore disappointment by the parasitic habits of these *Ichneumonidæ!* He has obtained some fine caterpillar, a great rarity, and by dint of much searching of his Westwood or his Stainton, feels quite certain that it is the larva of some much-prized butterfly. He ascertains its leaf-food; which it eats promisingly; all goes on encouragingly. Surely it cannot be far from the pupa state now! When some morning he is horrified to

behold, instead of the chrysalis, a host of filthy little grubs eating their way out of the skin of his beautiful caterpillar, or covering its remains with their tiny yellow cocoons.

Some of these parasites are so minute that their young are hatched and reared in the *eggs* of other insects. Bonnet found that the egg of a butterfly, itself no bigger than the head of a minikin pin, was inhabited by several of the stranger grubs; for out of twenty such eggs, he says, "a prodigious quantity" of the grubs were evolved.

A very interesting tribe of insects, so diverse from all other known forms as to constitute an order among themselves, that of the *Strepsiptera*, passes its youth in the bodies of certain wild bees. Mr Kirby's account of his first detection of one of these, though often quoted, is so interesting that I must cite it afresh. "I had previously observed," he remarks, "upon bees something that I took to be a kind of mite (*Acarus*), which appeared to be immovably fixed just at the inosculations of the dorsal segments of the abdomen. At length, finding three or four upon an *Andræna nigroænea*, I determined not to lose the opportunity of taking one off to examine and describe; but what was my astonishment when, upon my attempting to disengage it with a pin, I drew forth from the body of the bee a white fleshy larva, a quarter of an inch in length, the head of which I had mistaken for an acarus (*bee louse*)! After I had examined one specimen, I attempted to extract a second; and the reader may imagine how greatly my astonishment was increased,

when, after I had drawn it out but a little way, I saw its skin burst, and a head as black as ink, with large staring eyes and antennæ, consisting of two branches, break forth, and move itself quickly from side to side. It looked like a little imp of darkness just emerged from the infernal regions. My eagerness to set free from its confinement this extraordinary animal may be easily conjectured. Indeed, I was impatient to become better acquainted with so singular a creature. When it was completely disengaged, and I had secured it from making its escape, I set myself to examine it as accurately as possible; and I found, after a careful inquiry, that I had got a nondescript, whose very class seemed dubious."

Mr Newman, in an essay of much value,* has shewn that the larvæ of this tribe of insects are born alive, that they attach themselves to the abdomens of wild bees, nestling among the hair, and that they are thus introduced into the nest of the bee. Here it is somewhat uncertain how they are sustained at first, for at this time the bee-grubs are not hatched; probably they remain without food for some days, or devour a portion of the pollen and honey stored up. As soon, however, as the bee-grub is hatched, the Stylops-larva undergoes a metamorphosis, sheds its six legs, and becomes a footless maggot; it pierces the soft skin of the bee-grub, and feeds on its juices, till its maturity, as the Ichneumon on the body of the caterpillar.

When the perfect bee emerges in the following spring,

* "Affinities of the Stylopites," in *Zool.*, 1792.

it bears the full-grown Stylops, protruding from the rings of its abdomen. The latter is in pupa, all the organs being distinct and separate, but wrapped together, and inclosed in separate pellicles; very soon, it emerges, as described by Kirby, and escapes, leaving a great unsightly cavity in the body of the bee. This is the male: the female never escapes, but lays its eggs on the bee in which it has been reared, and then dies.

In the spring we frequently see among herbage a great uncouth beetle of a dark blue-black hue, with short wing-cases and long, heavy body, which discharges drops of yellow fluid when handled, and is therefore called the Oil-beetle (*Melöe proscarabæus*). The early stages of this beetle have much affinity with those of the *Stylops*. The beetle lays a number of yellow eggs in a hole in the earth; these produce little active six-footed larvæ, resembling lice, which crawl to the summit of dandelion and other flowers in the sunshine, and await the visit of a bee. On the arrival of one, the active grub immediately clings to its body, and is carried to the nest, not, however, to introduce itself parasitically into the body of the bee-grub, but to feed on the provision which the parent bee has stored up for its own young. Thus it becomes very fat, and grows to a size much larger than that of the full-grown bee-grub, having early dropped its six long clinging legs, which, having performed their proper function in catching hold of a bee, are no longer needed. It changes to a perfect beetle in autumn, lies in the bee's nest all the winter, and emerges in the spring.

The large jelly-like Medusæ which in summer are seen floating around our coasts, driving themselves along by alternate contractions and expansions of their umbrella, are frequently infested by little creatures of widely different organisation, Crustaceans belonging to the genera *Hyperia and Metoecus.* On the beautiful *Chrysaora* of the southern coast I have seen the *Metoecus medusarum,* a little shrimp about half-an-inch in length, with enormous lustrous green eyes, which takes up his residence in the cavities of the sub-umbrella,—dwelling in them as in so many spacious and commodious apartments, of which he takes possession, evidently without asking leave of the landlord, or paying him even the compliment of a peppercorn rent. Here he snugly ensconces himself, and feels so much at home, that he is not afraid to leave his dwelling now and then, to take a swim in the free water, returning to his chamber after his exercise; and here he rears his numerous family, which, in the form of tiny white specks, very much unlike their parents in shape, stud the membranes of the jelly-fish.

But, what is stranger still, Mr M'Cready has recently discovered in the harbour of Charleston in North America, a *Medusa* which is parasitic upon another *Medusa. Cunina octonaria* does not swim freely in the water, but inhabits the cavity of the bell of *Turritopsis nutricula.* "Not only does the latter furnish a shelter and dwelling-place for the larvæ during their development; it also serves as their nurse, by allowing the parasites, whilst adhering by their tentacles, to draw

nourishment out of its mouth by means of a large proboscis. In point of fact, the relation between them is of so unprecedented a nature, that the author may well be excused for having at first taken the impudent parasite for the gemmiparous progeny of the sheltering Medusa. The youngest state of this parasitic Medusa observed by the author formed a ciliated body of clavate form, adhering to the cavity of the bell by means of the slender stalk in which it terminated. The first change consists in the emission, from the thick end, of two slender flexible tentacles, and in the formation of a central cavity by liquefaction. At this stage of development, the author frequently observed gemmation taking place at the thicker end, sometimes frequently repeated. Subsequently the number of tentacles becomes doubled. These bend together over the clavate extremity, and are then employed, instead of the thin end of the body, in adhering to the cavity of the sheltering Medusa. The thin extremity then acquires a mouth, and may be recognised as a stomachal peduncle, which is employed, as above indicated, in obtaining nourishment. The morphological nature of the proboscis becomes still more distinct when, after the lapse of some little time, an annular fold makes its appearance immediately under the tentacles, which is recognisable from its form, and from the formation in it of (eight) otolithic capsules, as the first indication of the future bell. Simultaneously with the otolithic capsules, four rudimentary tentacles make their appearance between the four tentacles. The Medusa remains in this stage of develop-

ment for a long time. The bell gradually becomes more freely developed, and at last, by the reduction and entire disappearance of the stomachal peduncle, becomes the most essential part of the Medusa, after it has left its previous dwelling-place in the bell of the *Turritopsis*. The bell nevertheless retains for some time its earlier lobed form and unequal tentacles."*

More remarkable even than this association is the fact that certain true Fishes habitually reside in the stomachs of star-fishes. This circumstance, which had been observed in the Oriental Archipelago by MM. Quoy and Gaimard, and by Dr Bleeker, has recently been confirmed by Dr Doleschall, who has written a very interesting Memoir on it.

This learned naturalist states that the fact of the connexion between the fish and the star-fish is well known to most of the fishermen in Amboyna, and that he was able to obtain a sufficiency of specimens for examination; but as the star-fishes (and with them the fishes) speedily died in confinement, he was unable to make continuous observations upon them in a living state. Of the results of his observations he gives the following summary:—

"The fish stands to the star-fish in a definite relation which cannot be the object of observation. Why the little fish should always seek the stomachal cavity of one and the same species of star-fish, and not that of various species, is a mystery. It is well known that Crustaceans of the genus *Pagurus* inhabit the empty shells of Mol-

* Wiegmann's *Archiv.*, 1860, *Bericht*, p. 169.

lusca; but we find on the shore the same species of *Pagurus* in the shells of the most various genera and species.

"I have never met with *Oxybeles gracilis*, on the contrary, in any other species of star-fish than *Culcita discoidea*. The fish was described by Bleeker under the above name in 'Natuurkundig Tijdschrift,' vii., p. 162. The author proceeds to state that neither he nor any one else in Amboyna has ever captured the fish under other circumstances, or while swimming freely in the sea; but upon this Dr Bleeker remarks that many of his specimens of *Fierasfer Brandesii*, and all those of *Fierasfer* (*Oxybeles*) *gracilis* and *F. lumbricoides*, were obtained by him along with other fishes, and were probably taken while swimming freely in the sea.

"Upon the habits of *Oxybeles gracilis* the author goes on to say that it is certain that this animal passes the greater part of its existence in the stomach of the star-fish, rarely shewing itself outside of this, and then probably at night. That it does come out occasionally, appears from the fact that in two cases the author observed the fish with a portion of its body outside the cavity of the star-fish, and in the act of creeping in.

"The same observations shewed that the fish, in returning to its concealment, passes along the furrow of the lower surface of one of the arms leading to the mouth of the star-fish, which is wide enough, when the tentacles are retracted, to leave room for the passage of the slender body of the *Oxybeles*. This fact likewise proves that the

Oxybeles does not get into the stomach of the *Culcita* by accident.

"If a living *Culcita* be cut in two, the fish is seen moving freely in the cavity of its body. If it be taken out, it immediately seeks the shade. If the two halves of the *Culcita* (still alive) be placed in the water, the fish will soon be seen to draw towards them, in order to get into the cavity of the star-fish. When exposed to the light, it is uneasy, and its iris contracts excessively. The author never found two fishes in the same star-fish.

"In most of the fishes examined by him, the author found the stomach empty; it was full only in one. The contents of the stomach had the appearance of a lump of fat, and consisted of half-digested muscle. Under the microscope, striated muscular fibres could be detected, and the author thinks that they belonged to the muscles of a fish. This circumstance proves that *Oxybeles* does not feed upon the chyle of the star-fish, but that its nourishment is analogous to that of other fishes. Whether it seizes upon the fishes taken by the star-fish for its own nourishment must be determined by further investigations.

"The author's observations establish—

"1. That *Oxybeles gracilis* is not a true parasite.

"2. That it passes the greater part of its life in the stomach of *Culcita discoidea*, as is also indicated by the unusually pale colour of the fish.

"3. That, however, it can come out, either to seek nourishment, or for the purpose of reproduction.

"4. That it returns to the mouth along the furrow on the ventral surface of the arms.

"5. That it is very sensitive to light.

"6. That it feeds upon other animals.

"In fresh water the animals live for about half-an-hour. The pigment upon the peritoneum exhibits under the microscope the most beautiful stellate forms. The fish, possesses a swimming-bladder."*

Some very curious instances of parasitism occur, in which one kind of creature compels or induces another creature to labour for its special benefit. Indeed, in all cases, the parasite is benefited by the functions of the supporter; but, in the cases I refer to, the slavery is more special and more apparent.

There is a large species of Crab (*Dromia*) found in the West Indies, which is invariably found covered with a dense mass of sponge. The sponge is found to have grown in such a manner as to fit every prominence and cavity of the crab, exactly as if a plastic material had been moulded on it, yet it is not adherent to it, but is merely held in position by the hindmost pair of feet, which in this genus of crabs, are turned upwards, and apparently serve no other purpose than that of hooks to hold on the sponge *in situ*.

On our own shores we are familiar with the Hermit crabs making use of various kinds of univalve shells as houses to protect their softer hindparts; but in many of these cases there is a third party in the transaction, which

* *Ann. Nat. Hist.* for April, 1861.

is made to work for the crab's especial advantage. The shell of the mollusk is sometimes covered with a sort of fleshy polype-mass (*Hydractinia echinata*), which is parasitic on the shell. The shell, however, being tenanted also by the active crab, the polype, as it grows, moulds itself on the crab's body, and thus extends the dimensions of its house, so that it has no necessity either to enlarge its dwelling by the absorption of part of the interior shell-wall, or to leave this shell and search for one of ampler size, as other Hermit-crabs are obliged to do who have not the advantage of so accommodating a fellow-lodger. "One can understand," says Dr Gray, "that the Crab may have the instinct to search for shells, on which the coral [polype] has begun to grow; but this will scarcely explain why we never find the [polype] except on shells in which Hermit-crabs have taken up their residence." *

Small Annelids and Crustaceans not unfrequently burrow into the stony walls of corals; but Dr Gray records a much more uncommon case, from the Guilding collection. "It is an expanded coral, which forms a thin surface on the top of another coral, and is furnished with a number of small, depressed, horizontal cases, opening with an oblong mouth. Some of these contain within them a small, free, crustaceous animal, a *Cymothoa*, which nearly fits the case; and it is evident that, by their moving backwards and forwards on the surface, they have caused the animal of the coral to form one of these cases for the protection of each specimen." †

* *Zool.*, 204. † *Ibid.*, 205.

The manner in which this result is obtained is thus explained—"The animals which form their habitation in corals, appear to begin their domicile in the same way as the barnacles before referred to; they take advantage of the soft and yielding nature of the animals which form the corals, &c., and taking up a lodgement in their body, all they have to do is to keep a clear passage in it, either by the moving backwards and forwards, the exertion of their limbs, or the ingress or egress of water to and from their bodies, and in time, as the coral is secreted by the animal, it will form a wall round them; but if, by any accident, the parasite animal should not keep a passage from the coral to the surface of the body of the animal clear, which it must be constantly induced to do, since by this means it procures food, the coral animal will in a very short time close over it and bury it alive in the mass of the coral; and this, from the number of these animals, of all sizes and in different stages of growth, which are to be found in the substance of the large and massive corals, must often be occurring. Thus the Italian romance is often literally fulfilled in nature."

Certain birds are parasitic, in this sense, that they compel or induce other birds to perform the labour of incubation and of rearing their young. The Rhea or Ostrich of South America is parasitical on its own species; the females laying each several eggs in the nests of several other females, and the male ostrich taking all the cares of incubation. More familiar examples, however, occur in our own Cuckoo, and in the Cowpen birds (*Molothrus*

pecoris and *M. niger*) of North and South America. "These fasten themselves," as has been remarked by Mr Swainson, "on another living animal, whose animal heat brings their young into life, whose food they live upon, and whose death would cause theirs during the period of infancy."

The habit, at least in the case of the European Cuckoo, is so well known, that I need not do more than merely allude to the fact, that the female seeks for the nests of other insect-eating birds, always much smaller than itself, and deposits its own eggs,—a single egg in each; that this stranger egg is hatched by the foster-mother with all care, and the young bird is nurtured with all tenderness even at the expense of its own proper eggs and young, which in general are sacrificed in the course of the process. Every schoolboy knows these facts, but few perhaps have ever suspected the existence of a romantic feeling of love and fealty in the little bird towards the cuckoo herself, prompting the rendering of the service required as a coveted honour. Yet a naturalist has communicated to Mr Yarrell some facts which certainly look this way; and because they are indubitably the very romance of natural history, I cite them, leaving my readers to judge of their value.

"As you have contributed," writes Mr W. C. Newby of Stockton, "so much to the information and amusement of the numerous class of readers who take an interest in subjects of natural history, I consider it my duty to communicate first to you, what appears to me a new fact

in the habits and character of that general favourite the cuckoo.

"An egg of this bird was brought to me on the 6th instant, which had been taken from the nest of the yellow bunting, at a short distance from this town, and the boy who got the egg gave the following account, which, I think, may be relied on. When bird-nesting the previous Saturday, he found a nest of the gold spink (a local name for the yellow bunting) with the young birds just hatched. On visiting the nest the following day, he flushed the old bird, having seen her sitting on it, but the young birds were all excluded, and were lying dead near; and to his surprise, a single egg—the one he brought to me—occupied the place of the callow brood. He took away the egg (which is now in my possession) so that it is impossible to corroborate the statement in any degree. The above circumstance was first named to me by Tom Green, a well-known character and naturalist in this town, whom I have always found to be accurate in his observations on birds, and by him I was referred to the boy. On my objecting to Green that the accident appeared incredible, because unnatural, and contrary to strong parental instinct, he replied, "Ay, sir, but little birds are mightily ta'en up with a cuckoo; they'll awmost dee out for them;" and he related the following fact which came under his own observation. When out with his gun, collecting birds to stuff, (animal-preserving being one of his many trades), he shot at and wounded a cuckoo, which, after flying some distance, fell upon a hedge with its wings outstretched:

the attendant bird, which in this case was one of the pipits, continued in the flight of its patron after the shot, and when Green approached, he found it sitting on the body of the dead cuckoo.*

"It has been supposed by some, that small birds follow the cuckoo for the sake of annoyance, mistaking it for a sparrow-hawk, to give public notice of a pirate abroad, and to warn all peaceful subjects of the air against a common danger. But this is clearly not so, for the flight and cries clearly distinguish the feelings in the two cases. The attendance on the cuckoo is at a distance, silent and respectful; but in the other we have a sort of hue and cry raised, as it were, against a felon, and which is kept up from place to place, if not to the shame, at least to the discomfiture of the culprit.

"The cuckoo is certainly a favourite with them; as Green says, 'they, (the lesser birds,) are mightily ta'en up with it;' but to what it owes its influence with its parasites I leave to you and other philosophical naturalists to determine: I am content to relate, in simple terms, an interesting fact."

There is so much analogy with these cuckoo-proceedings in the habits of Ants, that, although these cannot correctly be designated as parasites, the details of their manners will not be wholly out of place, in winding up this chapter. I refer to the propensity manifested by certain species of ants to make slaves of the workers of another species, leading them into captivity and compelling

* *Zool.*, 2589.

them to labour for the benefit of the marauders. Strangely enough, the parallel between the human and the formican slave-trade holds to this further extent that, so far as we know, the kidnappers are red or pale-coloured ants, and the slaves, like true *niggers*, are black.

The slave-hunting expeditions are planned and executed with the utmost skill and courage. "When the red ants are about to sally forth on a marauding expedition, they send scouts to ascertain the exact position in which a colony of negroes may be found; these scouts, having discovered the object of their search, return to the nest, and report their success. Shortly afterwards the army of red ants marches forth, headed by a vanguard which is perpetually changing; the individuals which constitute it, when they have advanced a little before the main body, halting, falling into the rear, and being replaced by others: this vanguard consists of eight or ten ants only.

"When they have arrived near the negro colony, they disperse, wandering through the herbage and hunting about, as if aware of the propinquity of the object of their search, yet ignorant of its exact position. At last they discover the settlement, and the foremost of the invaders rushing impetuously to the attack, are met, grappled with, and frequently killed by the negroes on guard; the alarm is quickly communicated to the interior of the nest; the negroes sally forth by thousands, and the red ants rushing to the rescue, a desperate conflict ensues, which, however, always terminates in the defeat of the negroes, who retire to the inmost recesses of their habitation. Now follows

the scene of pillage; the red ants, with their powerful mandibles, tear open the sides of the negro ant-hill, and rush into the heart of the citadel. In a few minutes each of the invaders emerges, carrying in its mouth the pupa of a worker negro, which it has obtained in spite of the vigilance and valour of its natural guardians. The red ants return in perfect order to their nest, bearing with them their living burdens. On reaching the nest the pupæ appear to be treated precisely as their own, and the workers, when they emerge, perform the various duties of the community with the greatest energy and apparent good will; they repair the nest, excavate passages, collect food, feed the larvæ, take the pupæ into the sun-shine, and perform every office which the welfare of the colony seems to require; in fact, they conduct themselves entirely as if fulfilling their original destination."*

* Newman, *Hist. of Insects*, 50.

APPENDIX.

ON THE SEA-SERPENT.

SINCE the publication of my former volume, which concluded with an examination of the evidence for the existence of this unrecognised animal, two other important testimonies have been brought under my notice. The first of these is that of an officer of high literary reputation, the Consular representative of Great Britain lately residing at Boston, in the United States, who thus gives his personal testimony and that of his lady to the appearance of the monster:—

"On a Sunday afternoon in the middle of August, above a hundred persons, at that time in and about the hotel, were called on to observe an extraordinary appearance in the sea, at no great distance from the shore. Large shoals of small fish were rushing landwards in great commotion, leaping from the water, crowding on each other, and shewing all the common symptoms of flight from the pursuit of some wicked enemy. I had already more than once remarked this appearance from the rocks, but in a minor degree; and on these occasions I could always distinguish the shark, whose ravages among the "manhaidens" was the cause of such alarm. But the particular case in question was far different from those. The pursuer of the fugitive shoals soon became visible; and that it was a huge marine monster, stretching to a length quite beyond the dimensions of an ordinary fish, was evident to all the observers. No one, in short, had any doubt as to its being the sea-serpent, or one of the species to which the animal or animals so frequently before seen

belonged. The distance at which this one was, for ten minutes or a quarter of an hour, visible, made it impossible to give a description of its apparent dimensions so accurate as to carry conviction to the sceptical. For us who witnessed it, it was enough to be convinced that the thing was a reality. But one of the spectators, Dr Amos Binney, a gentleman of scientific attainments, drew up a minute account of it, which is deposited in the archives of one of the Philosophical Societies of Boston. I was and am quite satisfied that on this occasion I had a partial and indistinct but positive view of this celebrated nondescript. But had the least doubt rested on my mind, it would have been entirely removed by the event of the day following the one just recorded. On that day, a little before noon, my wife was sitting, as was her wont, reading on the upper piazza of the hotel. She was alone. The gentlemen, including myself and my son, were, as usual, absent at Boston, and the ladies were scattered about in various directions. She was startled by a cry from the house of "The sea-serpent! The sea-serpent!" But this had been so frequent, by the way of joke, since the event of the preceding day, and was so like "The wolf, the wolf!" of the fable, that it did not attract her particular attention for a moment or two, until she observed two women belonging to the family of the hotel-keeper running along the piazza towards the corner nearest the sea, with wonder in their eyes, and the cry of "The serpent, the serpent! He is turning, he is turning!" spontaneously bursting from their lips. Then my wife did fix her looks in the direction they ran; and sure enough she saw, apparently quite close beyond the line formed by the rising ground above the rocks, a huge serpent, gliding gracefully through the waves, having evidently performed the action of turning round. In an instant it was in a straight line, moving rapidly on; and after coasting for a couple of minutes the north-west front of the hotel, and (as accurately as the astonished observer could calculate) looking as it stretched at full length in the water about the length of the piazza, that is to say, about ninety feet; it sank quietly beneath the surface, and was seen no more.

"The person who was thus so lucky as to get this unobstructed

view, is one so little liable to be led astray by any imaginary impulse, that I reckon on her statement with entirely as much confidence as if my own eyes had demonstrated its truth."—*Grattan's Civilised America*, p. 39.

The second testimony is contained in the following communication with which I have been favoured by Mr Cave :—

35, WILTON PLACE, *April* 29, 1861.

SIR,—On reading your interesting "Romance of Natural History" it occurred to me that I could supply some corroborative evidence of the existence of the sea serpent. On looking up my old journals, I found it was slighter than I imagined; but, such as it is, I give it almost verbatim from my diary.

I was in Jamaica the year after you were, and have often regretted that we were not there together, as I might have shewn you parts of the island which you missed, and have been, perhaps, the cause of a few more pages to your very pleasant journal of a naturalist there.—Believe me, faithfully, yours,

STEPHEN CAVE,
M.P. for Shoreham.

Philip H. Gosse, Esq.

Extract from a Journal written during a Voyage to the West Indies in 1846.

Thursday, Dec. 10.—Off Madeira, on board R.M.S. "Thames." —"Made acquaintance with a Captain Christmas of the Danish navy, a proprietor in Santa Cruz, and holding some office about the Danish Court. He told me he once saw a sea-serpent between Iceland and the Faroe Islands. He was lying-to in a gale of wind, in a frigate of which he had the command, when an immense shoal of porpoises rushed by the ship, as if pursued; and, lo and behold! a creature with a neck moving like that of a swan, about the thickness of a man's waist, with a head like a horse, raised itself slowly and gracefully from the deep, and seeing the

ship it immediately disappeared again, head foremost, like a duck diving. He only saw it for a few seconds; the part above the water seemed about 18 feet in length. He is a singularly intelligent man, and by no means one to allow his imagination to run away with him."

THE END.

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